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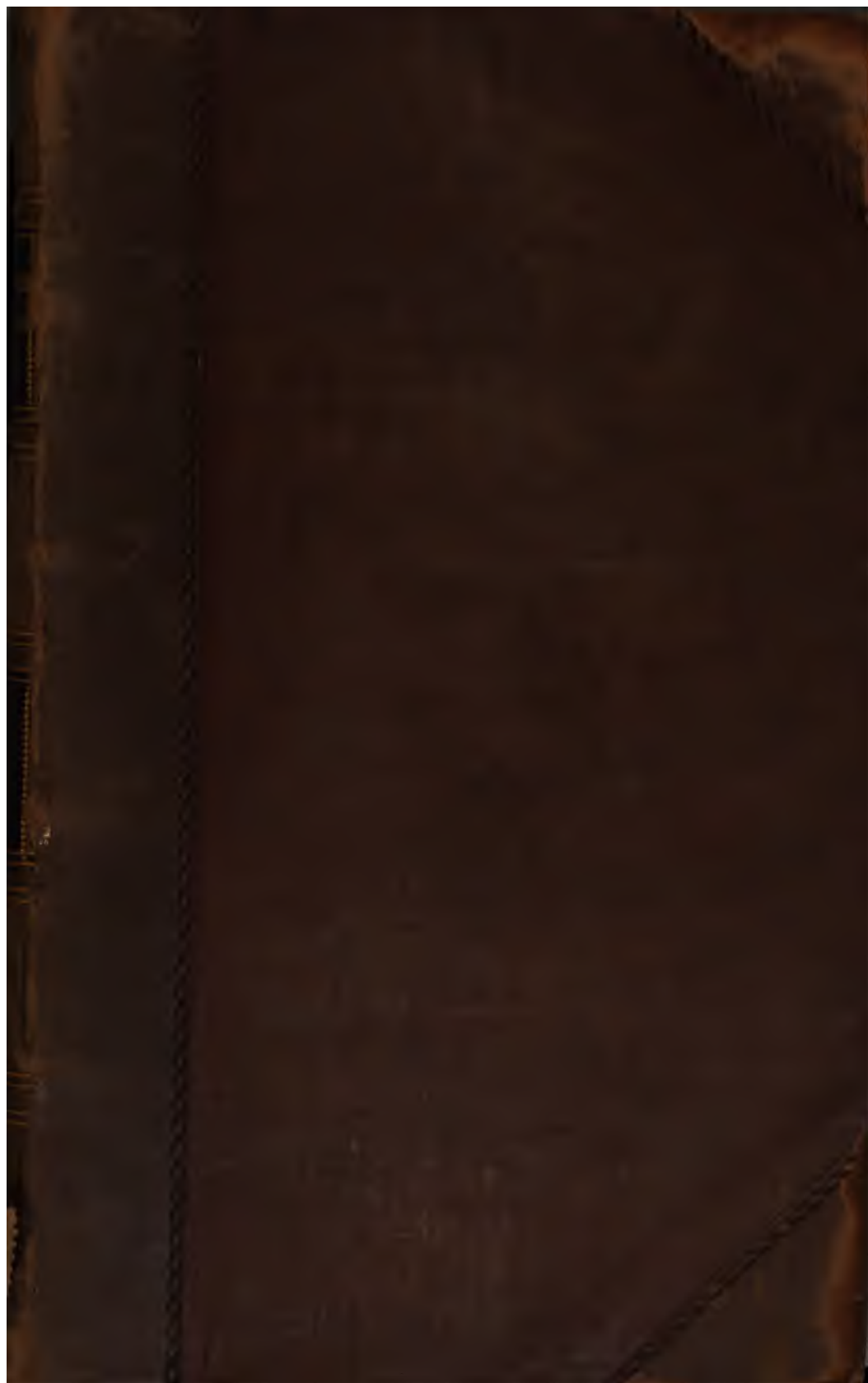
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GENERAL VIEW  
OF THE  
AGRICULTURE  
OF  
STIRLINGSHIRE;  
WITH  
OBSERVATIONS ON THE MEANS OF ITS IMPROVEMENT.

DRAWN UP FOR THE CONSIDERATION OF THE  
*BOARD OF AGRICULTURE*  
AND  
INTERNAL IMPROVEMENT.

---

WITH A MAP.

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By PATRICK GRAHAM, D. D.  
MINISTER OF ABERFOYLE.

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1812.



## INTRODUCTION.

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THE Reporter has just reason to apprehend that, in a volume of such multifarious contents, many errors will be found both in point of *opinion* and of *fact*.

From the *former* of these little danger can arise. The speculations which have been thrown out may be adopted or rejected at the pleasure of the reader. Speculation, in matters of science, has frequently been the means of eliciting new and important lights in subjects the most interesting to the human mind. "I feel not much reverence," says the ingenious and lamented Dr Beddoes, "for those who pique themselves upon pure experience. In most instances" (speaking of medicine) "a theoretical deliberation of some sort must precede prescription; and here the discrimination of persons habituated to speculation will have the superiority of skill over chance, and their fertility of resources will appear to peculiar advantage." And again, speaking of some early experiments, he observes that, "We cannot be surprised that these should not  
" have



“ have been attended with greater success, if we consider that those who made them could not, at that early period, be enlightened by the grateful dawn of a probable *theory*; and that having no well defined end in view, they could not vary their means with sufficient intelligence\*.”

With respect to errors in point of *fact*, the Reporter will only presume to say, that he has employed all the caution and diligence of which he is capable, in avoiding them. His sources of information have been very abundant; and he is deeply sensible that, without the communications, both oral and written, which he has received from gentlemen of all ranks, and residing in every district of the county, he could never have executed this work, such as it is. These communications were furnished with a liberality which does honour to their authors; and the Reporter will ever reflect, with high satisfaction, on his having had the good fortune to be the instrument of calling them forth. He has now only to request, that his friends, to whom he is so much indebted, will accept of this expression of the grateful sense which he entertains of their goodness.

Oct. 17.

1811. }

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\* Observations on the nature and cure of Calculus, &c.

p. 110, and 129.—London 1793.

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**AGRICULTURAL SURVEY**  
OF  
**STIRLINGSHIRE.**

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**CHAP. I.**

**GEOGRAPHICAL STATE AND CIRCUMSTANCES.**

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**SECT. 1.—SITUATION AND EXTENT.**

**T**HERE is no correct map of Stirlingshire. In 1745 a survey was made of this county, and a map published by William Edgar; some copies of which are still to be met with. This map was republished in 1777, by Mr Nimmo in his General History of Stirlingshire, without any geographical alteration. Since that period Mr Ross published a map of this county upon a large scale; but it abounds in inaccuracies. Mr Arrowsmith's excellent map of Scotland represents this county with tolerable  
A correctness.

correctness. By the help of all these, assisted by actual observation, the map of Stirlingshire, representing the soils, which is now offered, was constructed.

Stirlingshire is situated, according to the most accurate calculation that can be made, between  $55^{\circ}. 56'$  and  $56^{\circ}. 16'$  N. Latitude; and between  $3^{\circ}. 35'$  and  $4^{\circ}. 40'$  West Longitude from Greenwich. Its greatest length, measured from the point where the river Almond crosses the public road, near Linlithgow, on the east, to a line passing north and south along the shore of Lochlomond, near the barracks of Inversnaid, on the west, is 45 statute miles :—Its greatest breadth from north to south is about 21 miles, making a superficial extent of 945 square miles. But as the breadth of Stirlingshire is very far from being uniform throughout, it may be taken at a medium at 14 statute miles, making 630 square miles. The average square contents of the several parishes, and parts of parishes, of which this county consists, having been at the same time diligently calculated, the result, which is 660 square miles, corresponds pretty nearly with the above estimate : and it is presumed that, by dividing the difference, we shall come very near the truth. The superficial contents of the county will then be 645 square miles, equal to 412,800 English, or 328,300 Scots acres nearly.\*

Stirlingshire

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\* Mr Belsches of Greenyards, in a report of this county presented to the Board of Agriculture in 1796, states its extent to be 704 statute miles, or 358,336 Scots acres. There is reason to believe that he has somewhat exceeded in his calculation.

Stirlingshire is bounded on the north, throughout its whole extent, by the shire of Perth, and by the river and Firth of Forth; excepting that the whole parish of Alva, in this county, lies in an isolated situation, on the north of the Forth, and surrounded by the counties of Perth and Clackmanan;—and that those parts of the parishes of Logie and Lecropt, which belong to this county, lie also on the north of the river, in the bosom of Perthshire: it is bounded on the east by the Firth of Forth, and by Linlithgowshire; on the south by Lanarkshire and Dunbartonshire; and on the west by Dunbartonshire and Lochlomond.

It may be permitted to observe that Stirlingshire, with its rich mountain pastures, rising to a height of more than 3000 feet above the level of the sea, and its fertile plains sinking within a few feet of the same level;—its extensive natural woods, and thriving plantations;—the ornamented seats of noblemen and gentlemen; and the beautiful lake of Lochlomond, adorned with islands, possesses a degree of interest to which few counties in Britain can lay claim:—And if to its natural advantages, we add the interest arising from the abundance and variety of valuable minerals which are contained in the bowels of the earth; the important public works and manufactures that are carried on; the commerce of a sea port which is necessarily arising to a high degree of consideration in the trade even of this trading country; together with the perfection to which agriculture has been carried, or may be carried in this district; it will be allowed that an account of Stirlingshire, if properly executed, merits the attention of the political economist, the natural historian, the merchant, and the agriculturist.

## SECT. II.—DIVISIONS.

1. *Political*.—Stirlingshire constitutes a portion of the district anciently occupied by the Damii of Ptolomy; which comprehended not only this county, but also Clydesdale and Menteith.

The public functionaries of the county are a Lord Lieutenant, a sheriff-depute, and a sheriff-substitute. Previous to the Fox or Grenville administration, the counties of Stirling and Clackmanan were united under the jurisdiction of one sheriff-depute, with two substitutes; the one residing at Stirling, and the other at Alloa. But, during the above administration, a sheriff-depute was appointed to Stirlingshire alone, and another to the counties of Clackmanan and Kinross;—it is not even alleged that any inconvenience arose from the former arrangement.

Stirling is one of the towns which compose the Western Circuit; and is visited twice a year by the Lords of Justiciary. It is one of the boroughs of that district which, in electing a member to serve in parliament, includes also Culross, Inverkeithing, Dunfermline, and Queensferry. The county sends a member to parliament. The freeholders entitled to vote at the election are about 100.

Stirling is the only royal borough in the county; there are several boroughs of barony; the most considerable

derable of which are Falkirk, St Ninians, Kilsyth, Campsie, Kippen, &c.

The only other political division of the county, which seems to merit notice, is that of the different districts in which the monthly meetings of the Justices of peace are held; these are Stirling, Falkirk, Campsie, and Balfron.

2. *Ecclesiastical*.—The ecclesiastical divisions of the counties of Scotland are seldom regulated with any degree of uniformity. In no county, perhaps, is this irregularity more remarkable than in Stirlingshire. Some parishes in this county are connected not only with different synods, but even with different presbyteries, whose seats are fixed in other counties. The same want of uniformity of arrangement extends to parishes which lie partly in Stirlingshire, and partly in adjacent shires.

The following table will show at one view the ecclesiastical divisions of Stirlingshire, with their various arrangements.

<i>Parishes.</i>	<i>Presbyteries.</i>	<i>Provincial Synods.</i>
1. Stirling, . . . . .	Stirling.	Perth & Stirling.
2. St. Ninians, . . . . .	Do. . . . .	Do.
3. Gargunnock, . . . . .	Do. . . . .	Do.
4. Larbert & Dunipace, . . . . .	Do. . . . .	Do.
5. Alva, . . . . .	Do. . . . .	Do.
6. Airth, . . . . .	Do. . . . .	Do.
7. Bothkennar, . . . . .	Do. . . . .	Do.
8. Denny, . . . . .	Do. . . . .	Do.



<i>Parishes.</i>	<i>Presbyteries.</i>	<i>Provincial Synods.</i>
9. Kippen, partly in } Perthshire, . . }	. Dunblane, Perth & Stirling.	
10. Lecropt, partly in } Perthshire, . . }	. Do. . . Do.	
11. Logie, partly in } Perthshire, . . }	. Do. . . Do.	
12. Baldernock, . . .	. Dunbarton. Glasgow & Ayr.	
13. Balfron, . . . .	. Do. . . Do.	
14. Buchanan, . . . .	. Do. . . Do.	
15. Drymen, . . . .	. Do. . . Do.	
16. Fintry, . . . .	. Do. . . Do.	
17. Killearn, . . . .	. Do. . . Do.	
18. Strathblane, . . . .	. Do. . . Do.	
19. New Kilpatrick, partly } in Dunbartonshire, }	. Do. . . Do.	
20. Campsie, . . . .	. Glasgow, . Do.	
21. Kilsyth, . . . .	. Do. . . Do.	
22. Falkirk, . . . .	. Linlithgow. Lothian & Tweeddale.	
23. Muiravonside, . . . .	. Do. . . Do.	
24. Polmont. . . . .	. Do. . . Do.	
25. Slammanan, . . . .	. Do. . . Do.	

Thus it appears that there are 21 parishes situated wholly in Stirlingshire; and four situated partly in that, and partly in other counties. With regard to the discrepancy of their ecclesiastical distribution, it may be added, that little inconvenience arises from it in the administration of the policy or discipline of the church. The order of ecclesiastical procedure, in the different presbyteries and synods, being regulated through the whole church by the same laws, is uniform; and the sentence of an ecclesiastical court having no civil effect,

that

that of the civil magistrate, in the district in which he presides, is not in any respect affected by it.

Some parishes in this county are attached to the commissariat of Dunblane, and others to that of Stirling. Campsie, joined to Hamilton, forms a distinct commissariat.

### SECT. III.—CLIMATE.

In describing the climate of any district, it would seem, that, besides the latitude in which it is situated, the principal circumstances to be taken into the account are its position with respect to the adjacent seas, together with the various elevations of its mountains and vallies.

The latitude of Stirlingshire has been stated to be from  $55^{\circ}. 56'$  to  $56^{\circ}. 16'$  North. But forming, as it does, the isthmus of Scotland, washed on the east by the German ocean, and stretching on the west almost to the Atlantic, this county enjoys that peculiar mildness of temperature, which is the effect of the vicinity of the sea. Snows seldom fall to a great depth, or lie for a long time upon the ground. The severity of frost and snow seldom occurs before Christmas.

The various elevations of different parts of this county will appear from the following table :

*Feet above the level of the sea.*

Carses of Falkirk, Bothkennar, &c. from 12 to	20
Hill of Airth,.....	70
Highest elevation of the great canal,.....	162
Land in tillage on the verge of Slamanan- moss,.....	620
Kilsyth hills, .....	1360
Campsie Fells, .....	1500
Bencloch in Alya,.....	2420
Benlomond,.....	3262
Lochlomond,.....	22

The western part of the county is more rainy than the eastern, on account of the vicinity of the sea and the height of the mountains. Benlomond, towering without a rival at the western extremity, attracts the clouds, which burst in torrents upon the adjacent valleys,—taking their course, according to the occasional current of the winds, either towards the east, by the Strathblane and Campsie hills, or towards the north-east, along the mountains of Perthshire. The eastern parts of the county are warmer than the western, on account of their smaller elevation above the level of the sea.

The prevalent winds, as throughout the rest of Scotland, are from the south-west, as will be seen by the annexed tables :—From that quarter too proceeds our most violent storms and our heaviest rains. Even in the carses of Falkirk and Bothkennar, the trees and hedge-rows grow with a marked inclination towards the north-east. In spring the eastern parts of the country are frequently annoyed with cold and piercing winds

winds from the east; which, passing over a wide continent covered during many previous months with snow, have not had time to imbibe warmth and moisture from the narrow sea which they had swept in their course. These winds are often accompanied with a thick fog or haze, there called *eastern haurs*, which is unfriendly to health and vegetation. This haze seldom extends to the western parts of the county, being intercepted by the high grounds that intervene.

It is regretted that no register of the quantity of rain that falls in this district annually has been discovered by the reporter. He adopts the account given in a former report by Mr Belsches, by which it appears, "that, for the space of five years, beginning with 1776, the annual average number of days on which there was rain, was 206; and the average quantity of rain that fell in one year  $30\frac{1}{2}$  inches!"

When this estimate of the quantity of rain that falls in Stirlingshire is compared with the ascertained quantity that falls in adjacent situations, it would seem that it is near the truth. The quantity of rain that falls at Glasgow is 31 inches,\* at Dalkeith it is 25.124.† It may be proper to add, that the quantity of rain that falls annually in the western district of this county is certainly much greater than that which falls in the eastern;—the former may be considered as approaching to the Glasgow estimate,—the latter to that of Dalkeith.

The

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\* Stat. Ac. vol. v. 245. † Edin. Phil. Trans. vol. i. 208.

The reporter has the satisfaction to add tables of the winds, of the weather, and of the thermometer, for 14 years, and of the barometer for 11 years, kept with the utmost accuracy by his respected friend Dr Macfarlane, minister of Drymen, on the south-west verge of this county, at an elevation of about 70 feet above the level of the sea. It is true that these tables cannot be considered as applicable, with any precision, to the eastern parts of the county;—but it may be observed, that besides their value in reference to general science, they may be considered as a nearly just estimate of the objects to which they relate throughout that district of Scotland, at least which lies between  $56^{\circ}$  and  $56^{\circ}.40'$  north. lat. and between Stirling on the east, and the Atlantic sea on the west;—a district which includes the western parts of Stirlingshire, almost all Dunbartonshire, the southern and western parts of Pethshire, and a considerable portion of Argyleshire.

From these tables, which will naturally suggest to the scientific reader so many important conclusions, the following remarks obviously occur, viz.

1. That on an average of 14 years, the wind *Days*,  
 blows between N. and E. . . . . 105½  
 . . . . . from between N. & W. . . . . 91½  
 . . . . . from between S. & E. . . . . 29½  
 . . . . . from between S. & W. . . . . 197
2. The average of days completely fair for 14 years 158  
 . . . . . of showery days . . . . . 171½  
 . . . . . of days completely wet . . . . . 34  
 Days in the whole year more or less rainy . . . 205½

3. The average greatest heat for 14 years  $75^{\circ}$  } of *Fahrenheit*.  
 . . . . . of greatest cold . . . . .  $16^{\circ}$  . . . . .  
 . . . . . average heat of the year . . . . .  $45^{\circ}$  . . . . .
4. The average height of the barometer for 11 years  
 was . . . . .  $29\frac{4}{8}$  inches.

It may be concluded, upon the whole, that this is rather a showery than a rainy climate. The number of days *completely wet* is very inconsiderable, when compared with that of those *completely dry*: yet it appears that *some rain* falls on a number of days, not much less than two-thirds of the whole year. The quantity of rain which is thus distributed through about 205 days is not much more than 30 inches; whilst at Calcutta,\* the immense quantity of 81 inches falls on an average in about 78 days.

This gradual distribution of showers and rain appears admirably calculated for the nature of the soils which characterise that district of Scotland now under our consideration.—These consist chiefly of mountain pastures, which require a shower almost every day to preserve them in verdure, or of light arenaceous earth of little depth, which stands in need of frequently renewed supplies of moisture. These showers, accordingly, are only hurtful in the season of hay-making or of harvest; and it is the business of the prudent husbandman

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\* Asiatic Researches, vol. i. and ii. Appendix.

bandman to adapt the season of these operations as much as possible to the ordinarily observed course of the weather. In a climate so changeable as this, it is the business of the farmer to remark, to watch, and guard against the effects of the weather, especially in harvest, when the inadvertence or delay of a single day or even of a few hours, may be attended with the most fatal consequences. In such a climate every farmer should be somewhat versed in the ordinary prognostics of the weather. Long experience has given rise to a set of maxims on this subject, which are not unworthy of the attention of the physiologist, whilst they are the common guides even of the most illiterate.

Thus, in the upper parts of Stirlingshire, the adjacent mountains, towering to the height of more than 3000 feet, serve to indicate by their phasis the approaching weather. When dry vapours prevail in the atmosphere, they produce a haziness around distant objects, which occasions their outlines to be seen faintly and indistinctly. This appearance of the distant mountains is considered to portend fair weather. When, again, the atmosphere is saturated with moisture, it acts as a lens or magnifier—the distant mountains seem to approach the eye, and the outline of the objects on their surface becomes distinct. This appearance indicates the approach of rain.

This is given merely as an instance of the proper sagacity which the farmer should employ in judging of the weather. Many others might be adduced; but it is sufficient to observe, that, as every district of country has its own peculiar phenomena of the weather, it belongs

belongs to every one to study those of that in which he himself resides ; and, from a series of observations, to draw the just conclusions. The agriculturist should, for this purpose, be provided with those instruments which science has invented to assist in so material an investigation. He should have a barometer, and know the use of it,—to this he may add a thermometer and a hygrometer.

## TABLE



TABLE I.

YEAR AND MONTH.	WINDS.				Thermo- meter.		Weather.		
	No. of days from N. to E.	No. of days from N to W.	No. of days from S. to E.	No. of days from S. to W.	Greatest height.	Lowest.	No. of days completely fair.	No. of days showery.	No. of days com- pletely wet.
1795.									
January . . .	10	0	0	3	33	7	7	3	3
February . . .	24	1	1	2	36	6	14	9	5
March . . . .	10	10	3	8	46	17	11	10	10
April . . . . .	9	3	4	14	48	33	10	15	5
May . . . . .	4	13	5	9	64	39	13	16	2
June . . . . .	10	3	2	15	71	48	16	9	5
July . . . . .	6	14	1	10	75	49	17	10	4
August . . . .	3	2	4	22	76	48	13	13	5
September . .	8	2	9	11	69	42	14	15	1
October . . . .	10	3	7	11	59	42	6	16	9
November . . .	9	9	0	12	52	17	16	10	4
December . . .	6	11	3	11	54	33	5	20	6
1795 . . . . .	109	71	39	128	76	6	142	146	59
1796.									
January . . . .	3	4	8	16	52	35	11	13	7
February . . . .	11	6	7	5	52	33	8	17	4
March . . . . .	16	3	4	8	52	29	20	10	1
April . . . . .	12	8	3	7	66	40	18	11	1
May . . . . .	16	7	3	5	67	35	12	18	1
June . . . . .	2	11	0	17	71	43	10	18	2
July . . . . .	2	7	5	17	72	48	6	22	3
August . . . . .	1	9	1	20	74	46	17	14	0
September . . .	9	7	5	9	70	46	15	15	0
October . . . .	2	15	5	9	59	30	17	10	4
November . . .	11	13	3	3	47	25	18	10	2
December . . .	15	9	5	2	47	19	20	10	1
1796 . . . . .	100	99	49	118	74	19	172	168	26

TABLE II.

Year and Month.	Winds.				Thermo- meter.		Weather.		
	No. of days from N. to E.	No. of days from N. to W.	No. of days from S. to E.	No. of days from S. to W.	Greatest height.	Lowest.	No. of days com- pletely fair.	No. of days showery.	No. of days com- pletely wet.
1797									
January	12	5	5	9	59	26	8	18	5
February	0	7	5	16	51	30	21	4	3
March	15	4	5	7	50	26	23	7	1
April	14	8	4	4	59	35	14	16	0
May	9	8	1	13	67	34	11	20	0
June	10	6	0	14	67	43	15	14	1
July	5	8	2	16	72	50	8	19	4
August	2	8	2	19	68	52	8	21	2
September	4	7	3	16	63	42	8	15	7
October	11	7	3	10	59	26	14	10	7
November	11	5	2	12	50	20	18	6	6
December	5	7	6	13	48	23	9	15	7
1797	98	80	38	149	72	20	157	165	43

TABLE III.

Year and Month.	Winds.				Thermo- meter.		Baro- meter.	Weather.		
	No. of days from N. to E.	No. of days from N. to W.	No. of days from S. to E.	No. of days from S. to W.	Greatest height.	Lowest.	Average height for the month.	No. of days com- pletely fair.	No. of days showery.	No. of days com- pletely wet.
1798										
Jan.	7	9	4	11	48	28		7	19	5
Feb.	5	5	2	16	50	34		15	7	6
March	7	10	2	12	54	25		16	15	0
April	6	2	7	15	67	39		12	16	2
May	9	8	0	14	64	44	29 <sup>67</sup> 29 <sup>100</sup>	21	10	0
June	1	13	1	15	74	53	29 <sup>73</sup>	17	12	1
July	3	3	2	23	70	52	29 <sup>31</sup>	10	18	3
Aug.	2	8	1	20	69	41	29 <sup>92</sup>	19	10	2
Sep.	4	4	0	22	67	42	30 <sup>23</sup>	9	17	4
Oct.	11	4	4	12	62	38	29 <sup>67</sup>	12	17	2
Nov.	12	3	1	14	53	26	29 <sup>14</sup>	12	16	2
Dec.	20	2	4	5	45	10	29 <sup>92</sup>	17	12	2
1798	86	71	28	179	74	10	29 <sup>67</sup>	167	169	29

TABLE IV.

Year and Month	Winds.				Thermo- meter.		Baro- meter.	Weather.		
	No. of days from N. to E.	No. of days from N. to W.	No. of days from S. to E.	No. of days from S. to W.	Greatest height.	Lowest.	Average height for the month.	No. of days com- pletely fair.	No. of days showery.	No. of days com- pletely wet.
1799										
Jan.	8	4	2	17	48	25	29 <sup>83</sup> <sub>780</sub>	14	15	2
Feb.	13	3	3	9	50	17	29 <sup>00</sup>	11	15	2
March	21	2	5	3	52	28	29 <sup>40</sup>	16	13	2
April	17	9	0	4	58	31	29 <sup>68</sup>	13	14	3
May	13	5	3	10	58	37	29 <sup>78</sup>	10	16	5
June	7	6	0	17	75	44	29 <sup>86</sup>	22	8	0
July	6	3	4	18	72	50	29 <sup>16</sup>	17	12	2
August	3	10	2	16	66	48	29 <sup>2</sup>	13	15	3
Sept.	14	6	1	9	70	40	29 <sup>11</sup>	14	11	5
Octob.	5	7	0	19	55	32	29 <sup>33</sup>	11	14	6
Nov.	8	4	2	16	47	31	29 <sup>69</sup>	15	3	12
Dec.	20	5	1	5	43	21	29 <sup>97</sup>	21	10	0
1799	135	64	23	143	75	17	29 <sup>61</sup>	177	146	42
1800										
Jan.	17	4	5	5	45	21	29 <sup>49</sup>	12	13	6
Feb.	23	3	0	2	45	27	29 <sup>77</sup>	20	6	2
March	19	4	3	5	57	27	29 <sup>81</sup>	23	6	2
April	3	3	5	19	57	36	29 <sup>41</sup>	9	15	6
May	12	3	4	12	64	36	29 <sup>71</sup>	14	17	0
June	5	14	0	11	71	47	29 <sup>83</sup>	21	9	0
July	0	1	0	30	74	49	29 <sup>89</sup>	20	10	1
August	5	10	3	13	76	47	29 <sup>92</sup>	18	13	0
Sept.	9	7	2	12	69	41	29 <sup>63</sup>	11	17	2
Oct.	5	11	1	14	58	39	29 <sup>77</sup>	9	20	2
Nov.	4	14	0	12	53	26	29 <sup>43</sup>	12	15	3
Dec.	18	4	0	9	48	18	29 <sup>14</sup>	13	16	2
1800	120	78	23	144	76	18	29 <sup>61</sup>	182	157	26

TABLE V

Year and Month.	Winds.				Thermo- meter		Weather.			Baro- meter.
	No. of days from N. to E.	No. of days from N. to W.	No. of days from S. to E.	No. of days from S. to W.	Greatest height.	Lowest.	No. of days com- pletely fair.	No. of days showery.	No. of days com- pletely wet.	Average height for the month.
1801										
Jan.	5	13	0	13	48	31	6	22	3	29 <sup>60</sup> <sub>100</sub>
Feb.	13	7	1	7	51	29	9	12	7	29 <sup>67</sup>
March	4	12	1	14	54	27	10	19	2	29 <sup>65</sup>
April	5	11	0	14	63	28	19	11	0	29 <sup>82</sup>
May	8	4	4	15	68	43	9	16	6	29 <sup>75</sup>
June	4	12	0	14	71	51	21	9	0	29 <sup>99</sup>
July	14	4	2	11	73	44	13	16	2	29—
Aug.	8	9	4	10	74	50	26	5	0	—
Sept.	10	4	7	9	67	40	18	10	2	29 <sup>89</sup>
Oct.	6	7	1	17	62	36	10	18	3	29 <sup>54</sup>
Nov.	5	11	0	14	53	22	13	14	3	29 <sup>45</sup>
Dec.	10	13	1	7	42	21	14	13	4	29 <sup>29</sup>
1801	92	107	21	145	74	21	168	165	32	29 <sup>60</sup>
1802										
Jan.	7	7	0	17	47	19	12	13	6	29 <sup>55</sup>
Feb.	4	9	0	15	51	27	10	13	5	29 <sup>51</sup>
March	0	12	0	19	51	30	8	20	3	29 <sup>57</sup>
April	2	9	2	17	58	37	6	21	3	29 <sup>70</sup>
May	9	15	3	4	78	29	20	11	0	29 <sup>82</sup>
June	1	12	0	17	68	38	11	16	3	29 <sup>62</sup>
July	4	10	0	17	66	42	9	20	2	29 <sup>54</sup>
Aug.	6	5	4	16	70	50	11	16	4	29 <sup>71</sup>
Sept.	6	7	2	15	67	35	13	14	3	29 <sup>72</sup>
Oct.	10	6	0	15	63	36	7	19	5	29 <sup>46</sup>
Nov.	27	0	3	0	51	25	20	9	1	29 <sup>56</sup>
Dec.	10	4	3	14	49	28	14	14	3	29 <sup>52</sup>
1802.	86	96	17	166	78	19	141	186	38	29 <sup>60</sup>

TABLE VI.

Year and Month	Winds.				Thermo- meter.		Baro- meter.	Weather.		
	No. of days from N. to E.	No. of days from N. to W.	No. of days from S. to E.	No. of days from S. to W.	Greatest height.	Lowest.	Average height for the month.	No. of days com- pletely fair.	No. of days showery.	No. of days com- pletely wet.
1803										
Jan.	22	2	4	3	46	34	29 <sup>34</sup>	14	14	3
Feb.	3	17	0	8	45	21	29 <sup>59</sup>	9	15	4
March	10	9	2	10	55	25	29 <sup>90</sup>	15	12	4
April	3	11	2	14	65	36	29 <sup>65</sup>	8	21	1
May	5	16	0	10	59	38	29 <sup>72</sup>	16	15	0
June	7	13	1	9	69	39	29 <sup>79</sup>	18	10	2
July	3	4	4	20	75	48	29 <sup>95</sup>	20	11	0
Aug.	5	9	2	15	70	45	29 <sup>78</sup>	12	14	5
Sept.	4	10	3	13	66	34	29 <sup>95</sup>	17	13	0
Oct.	5	12	0	14	61	32	29 <sup>95</sup>	17	12	2
Nov.	13	7	3	7	48	24	29 <sup>40</sup>	12	15	3
Dec.	21	3	2	5	48	18	29 <sup>46</sup>	10	18	3
1803	101	113	23	128	75	18	29 <sup>70</sup>	168	170	27
1804										
Jan.	8	1	10	12	50	8	29 <sup>15</sup>	8	20	34
Feb.	9	15	2	3	46	17	29 <sup>97</sup>	18	10	18
March	18	4	1	8	50	24	29 <sup>7</sup>	9	18	60
April	10	11	0	3	57	27	29 <sup>67</sup>	6	24	0
May	5	4	9	18	66	44	29 <sup>75</sup>	10	18	3
June	3	8	0	19	74	46	29 <sup>89</sup>	15	11	4
July	10	5	8	8	72	46	29 <sup>77</sup>	16	15	0
Aug.	8	9	3	11	68	48	29 <sup>77</sup>	12	19	0
Sept.	7	5	6	12	71	44	29 <sup>93</sup>	14	16	0
Oct.	6	4	8	13	55	36	29 <sup>42</sup>	6	23	2
Nov.	23	2	1	4	51	25	29 <sup>82</sup>	13	14	3
Dec.	22	3	4	2	44	15	29 <sup>84</sup>	19	11	1
1804	127	71	52	114	74	8	29 <sup>71</sup>	146	200	20

TABLE VII.

Year and Month.	Winds.				Thermo- meter.		Baro- meter	Weather.		
	No. of days from N. to E.	No. of days from N. to W.	No. of days from S. to E.	No. of days from S. to W.	Greatest height.	Lowest.	Average height for the months.	No. of days com- pletely fair.	No. of days showery.	No. of days com- pletely stormy.
1805										
Jan.	17	2	4	8	46	27	29 <sup>41</sup>	12	18	1
Feb.	7	10	2	9	47	22	29 <sup>47</sup>	11	14	3
March	8	7	7	9	51	32	29 <sup>70</sup>	11	15	5
April	10	6	7	7	58	33	29 <sup>81</sup>	12	16	2
May	14	9	—	8	64	33	29 <sup>79</sup>	15	16	—
June	4	12	2	12	74	42	29 <sup>84</sup>	12	18	—
July	1	11	3	16	74	53	29 <sup>79</sup>	11	18	2
Aug.	1	7	3	20	69	47	29 <sup>76</sup>	11	18	2
Sept.	6	7	1	16	71	42	29 <sup>82</sup>	11	17	2
Oct.	18	8	—	5	58	29	29 <sup>97</sup>	21	10	—
Nov.	11	10	4	5	54	30	29 <sup>99</sup>	20	9	1
Dec.	6	16	—	9	51	25	29 <sup>53</sup>	13	15	3
1805	103	105	33	124	74	22	29 <sup>74</sup>	160	184	21
1806										
Jan.	7	11	2	11	47	24	29 <sup>38</sup>	10	18	3
Feb.	7	6	4	11	45	14	29 <sup>68</sup>	8	16	4
March	16	10	3	2	53	22	29 <sup>71</sup>	19	11	1
April	13	8	1	8	63	27	30 <sup>9</sup>	18	11	1
May	18	7	1	5	72	34	29 <sup>93</sup>	22	7	2
June	3	10	2	15	69	42	29 <sup>99</sup>	15	12	3
July	7	6	4	14	71	50	29 <sup>74</sup>	10	17	4
Aug.	7	6	2	16	71	50	29 <sup>74</sup>	11	19	1
Sept.	—	9	—	21	65	44	29 <sup>89</sup>	9	13	8
Oct.	16	7	8	—	60	32	29 <sup>74</sup>	17	12	2
Nov.	3	9	2	16	53	31	29 <sup>68</sup>	6	23	1
Dec.	6	9	1	15	54	31	29 <sup>44</sup>	5	21	5
1806	103	98	33	134	72	14	29	150	180	35

TABLE VIII.

Year and Month.	Winds.				Thermo- meter.		Baro- meter.	Weather.		
	No. of days from N. to E.	No. of days from N. to W.	No. of days from S. to E.	No. of days from S. to W.	Greatest hei., ht.	Lowest.	Average height for the month.	No. of days com- pletely fair.	No. of days com- pletely showery.	No. of days com- pletely wet.
1807										
Jan.	7	9	2	13	48	19	29 <sup>72</sup>	8	18	5
Feb.	4	14		10	50	22	29 <sup>62</sup>	8	19	1
March	12	11	1	7	49	25	30	15	13	3
April	6	9	3	12	56	29	29 <sup>74</sup>	11	15	4
May	17	7		7	75	34	29 <sup>76</sup>	14	13	4
June	9	7	1	13	69	46	29 <sup>74</sup>	11	19	
July	5	7	6	13	70	47	29 <sup>79</sup>	11	18	2
Aug.	6	6	2	17	71	45	29 <sup>77</sup>	7	20	4
Sept.	6	12		12	56	35	29 <sup>70</sup>	9	17	4
Oct.	9	8		14	61	38	29 <sup>68</sup>	5	19	7
Nov.	11	15	4		43	19	29 <sup>47</sup>	15	13	2
Dec.	7	14	2	8	48	19	29 <sup>84</sup>	16	10	5
1807	99	119	21	126	75	19	29 <sup>75</sup>	130	194	41
1808										
Jan.	3	17		11	46	19	29 <sup>56</sup>	7	18	6
Feb.	4	17		8	53	22	30 <sup>6</sup>	14	15	
March	26	3		2	52	29	30 <sup>16</sup>	22	8	1
April	8	14	2	6	56	31	29 <sup>94</sup>	13	16	1
May	7	3	4	17	71	45	29 <sup>79</sup>	11	15	5
June	9	6	4	11	78	44	29 <sup>91</sup>	17	12	1
July	16	3		12	80	42	29 <sup>40</sup>	14	12	5
Aug.	5	5	3	18	68	43	29 <sup>70</sup>	8	20	3
Sept.	12	9	2	7	66	41	29 <sup>83</sup>	13	16	1
Oct.		18	2	11	53	33	29 <sup>52</sup>	10	15	6
Nov.	13	7		10	52	26	29 <sup>54</sup>	14	12	4
Dec.	14	9		8	52	1	29 <sup>25</sup>	13	12	6
1808	117	111	17	121	80	19	28	156	171	39



TABLE IX.

Years.	Winds				Thermo- meter.		Barom-eter.			Weather.		
	No. of days from N. to E.	No. of days from N. to W.	No. of days from S. to E.	No. of days from S. to W.	Greatest height.	Lowest.	Greatest height during the year.	Lowest during the Year.	Average height during the year.	No. of days com- pletely fair.	No. of days showery.	No. of days com-
1795	100	71	39	128	72	6				146	146	59
1796	100	99	49	118	74	19				172	168	29
1797	98	80	38	149	72	20				157	165	48
1798	87	71	28	179	74	10	30 <sup>55</sup>	28 <sup>29</sup>	29 <sup>67</sup>	167	169	29
1799	135	64	23	143	75	17	30 <sup>47</sup>	28 <sup>72</sup>	29 <sup>61</sup>	177	146	42
1800	120	78	23	144	76	18	30 <sup>24</sup>	28 <sup>60</sup>	29 <sup>65</sup>	182	157	26
1801	92	107	21	145	74	21	30 <sup>35</sup>	28 <sup>45</sup>	29 <sup>60</sup>	168	165	32
1802	86	96	17	166	78	1	30 <sup>31</sup>	28 <sup>59</sup>	29 <sup>60</sup>	141	186	38
1803	101	113	23	128	75	18	30 <sup>39</sup>	28 <sup>37</sup>	29 <sup>70</sup>	168	160	27
1804	129	71	52	114	74	8	30 <sup>49</sup>	28 <sup>85</sup>	29 <sup>73</sup>	146	200	20
1805	103	105	33	124	74	22	30 <sup>68</sup>	28 <sup>29</sup>	29 <sup>74</sup>	160	184	21
1806	103	98	30	134	72	14	30 <sup>21</sup>	28 <sup>12</sup>	29 <sup>72</sup>	150	180	35
1807	99	119	21	126	75	19	30 <sup>61</sup>	28 <sup>28</sup>	29 <sup>75</sup>	130	194	41
1808	117	111	17	121	80	18	30 <sup>92</sup>	28 <sup>53</sup>	29 <sup>72</sup>	156	171	39
Average of 14 Years.	105 <sup>1</sup> / <sub>2</sub>	91 <sup>1</sup> / <sub>2</sub>	29 <sup>1</sup> / <sub>2</sub>	137	75	16				158	171 <sup>1</sup> / <sub>2</sub>	34
Average of 11 Years.									29 <sup>68</sup> / <sub>100</sub>			

## SECT. IV.—SOIL.

THE soil is the foundation as well as the nurse of vegetation; and a proper knowledge of its various characters and qualities may well be considered as the first study of the agriculturist. It is in the substratum of the soil that plants spread their roots; search for their food; and seek for support against the blast. Without entering into a philosophical discussion concerning the food of plants, it may be permitted to observe, that water or moisture constitutes a very essential part of it. That soil then is the best, all other things being equal, which is best calculated to receive and to retain that quantity of moisture which is necessary to feed the vegetables that grow on it, as well as to absorb and throw off what is superfluous, and would prove hurtful. A soil consisting chiefly of silex or sandy particles receives, but cannot retain the quantity of moisture proper for vegetation: a mere clay, and, still more, a till, are impervious to water; it stagnates on the surface, and prevents the growth of plants. The siliceous soil may be corrected by the admixture of manures, and of adhesive earths:

clay and till may be corrected by pulverization ; by exposure to the atmosphere ; and by the admixture of siliceous and calcareous substances.

Stirlingshire exhibits every variety of soil, the *chalky* alone excepted, that is to be found in the island. In describing these, the most natural method seems to be to carry the reader, by a topographical *coup d'oeil*, through the various districts of this county, delineating, as we pass along, the different soils ; and endeavouring, from time to time, to give interest to the picture, by introducing a slight sketch of the appearances and productions of the country.

TOPO.

## TOPOGRAPHICAL VIEW

OF

## STIRLINGSHIRE,

WITH A SKETCH OF ITS SOILS \*.

BEGINNING by the western part of this county, the parishes of Buchanan and Drymen form an irregular four sided figure, the greatest length of which extends from west to east about 18 miles : the greatest breadth of this trapezium, at the western extremity, is no more than three miles ; and, at the eastern, about eleven. It is bounded on the west by Lochlomond, through the extent of about 15 miles : one half of this beautiful lake, throughout this extent, is justly claimed by Stirlingshire, including the islands belonging to his Grace the Duke of Montrose, with the sole exception of the romantic island of Inchmurrin, the property also of his Grace, and his deer parks, but belonging to no parish or county, as far as has been yet ascertained. The principal islands in Lochlomond undoubtedly belonging to Stirlingshire,

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\* Here it will be proper to have recourse to the map which accompanies this report.

lingshire, are *Inchcaillich*, or the Nun's Island, chiefly covered with oak ; *Inchfad*, and *Inchcruin*, mostly arable ; with many islets of smaller size.

The banks of the lake are beautifully skirted with valuable coppice woods, chiefly consisting of oak, but intermixed with ash, birch, and alder : the northern side of this district, lying along the water of Duchray, is also skirted with wood, though more sparingly. Patches of arable ground, of an arenaceous soil, occur, from time to time, along the banks of the lake, and of the river. By far the greatest portion of this district is mountainous, and fit only for pasture. Some meadows, producing natural grass, occur in the vallies : Benlomond is almost free from heath : it is covered with a grassy sward, which affords the finest pasture for sheep. The lower mountains are mostly heathy : the soil is principally a thin covering of moss, with a subsoil of reddish and tilly earth : the pasture which *these* afford is of an inferior kind.

It may be observed, however, that the pasture on these heathy mountains is yearly improving, since the almost universal introduction of sheep. In spring, it is the general practice to set fire to these extensive heaths, which is permitted until the 5th day of April ; after which day, the burning of heath is prohibited by act of Parliament, on account of the game. The first year after the heath is burnt, tender shoots of that plant spring up, intermixed with herbage, affording a grateful pasture to cattle. The sheep continually browsing on these tender shoots, especially in winter, prevent the heath ever after from attaining its former luxuriance ; and, in process of time, it disappears altogether. Many  
mountains,

mountains, which, in the memory of man, were covered with coarse heath, and of little value for pasture, are now entirely green, and covered with rich herbage.

The banks of the Endric, and of the Blane, which falls into it, present two beautiful vallies or straths, the prevailing soil of which is either a fine light loam, or a sharp quick arenaceous mould.

At Killearn, that chain of mountains which extend from Dunbarton to Stirling, after being interrupted by the valley of the Blane, re-commences ; and stretching eastwards, in different divisions, under the various denominations of the Killearn, the Campsie, the Kilsyth, the Dundaff, Fintry, and Gargunnoch hills, or more generally, under that of *the Lennox hills*, constitutes the most valuable pasture lands in Scotland. The soil of these mountains is chiefly arenaceous, mingled with till ; moss earth also frequently occurs. There is almost no heath : on the Dundaff hills, indeed, a stunted heath occupies a considerable space ; but still the pasture is excellent. The different plants, which chiefly constitute the herbage, will be afterwards enumerated.

Directing the eye eastward, along the northern exposure of these mountains, an extensive district of near 20 miles, presents itself towards Stirling, consisting of the parishes of Balfron, Killearn, Kippen, and Gargunnoch : this track of country slopes gently from the mountains on the south, to the river Forth, on the north ; the soil improving in fertility as it retires from the mountains. On the high grounds of Balfron and Kippen, we meet with a heathy muir or moss of great extent, which seems to be a continuation of the muirs of Buchanan and Drymen, stretching eastwards from Benlomond.—

The

The subsoil of this elevated stretch of ground is, almost throughout, either an impervious till, or a still more impervious rock of a reddish kind of free-stone. Though the greatest part of this district is held under tillage, the disadvantages under which it lies from the coldness of the bottom, and from the difficulty of drawing off the moisture, are very considerable. This soil is particularly unfavourable to turnip husbandry. Excepting in a few patches of dry gravelly soil, which occur from time to time, the culture of turnips is considered as injurious. The only way in which it would seem that turnip husbandry can be advantageously attempted in such soils is, by taking them up with dry weather, in the end of autumn, and by stacking them; and then, by setting up the ground immediately in ridges, that the water may run off.

As you descend towards the banks of the Forth, rich clay or carse ground occurs, interrupted, at times, by considerable patches of moss, with a subsoil of the same clay or carse.

On each side, and in the interstices, or interruptions of this chain of mountains, several beautiful vallies or *straths*, as they are called, occur, of more or less value in an agricultural point of view. The narrow, but fertile vale of Fintry, consists chiefly of an arenaceous soil, with some instances of loam, on the banks of the Endric.

A ride through the vallies which intersect the Lennox hills, is rendered interesting by various objects of high importance to the agriculturist. In travelling eastwards from Fintry towards Denny, we find the lower grounds adjacent to the Endric, which has its rise in these

these hills, much injured by the overflowing of the river, and by the confluence of mountain streams. The soil is light and sandy; and the low grounds are covered, throughout a considerable extent, with large stones, and coarse gravel, carried down by the torrents. Nor does it seem practicable to remedy this evil by embanking the river, on account of the shallowness of the channel, which, for about three miles, is almost on a level with the adjacent fields; and even though the channel were dug, at a great expence, to a sufficient depth, the first land flood would inevitably choak it up with the stones and gravel which are carried down by the mountain streams.

About three miles beyond Fintry, the Endric forms a magnificent cascade, falling irregularly over a precipice of 91 feet high; and furnishing to the lover of picturesque scenery, a picture not often to be met with even in Stirlingshire. Beyond this elevation, the country changes its character. The soil becomes thin, and the climate cold and bleak: still the herbage is rich, and well adapted to pasturage, in which, accordingly, it is principally employed.

The river Carron, celebrated in ancient history and in song, as well as in the annals of modern manufacture, has its rise in these mountains, in the vicinity of the source of the Endric; the former flowing into the Firth of Forth, and the latter into that of Clyde. Near the source of the Carron, as soon as it reaches the valley, the Carron Bog, as it is called, presents to the traveller the prospect of the most extensive natural meadow that is to be met with, perhaps, in Scotland. "Its length is four miles: it is, in some places, two miles in breadth; and



and in no place less than one \*." It may be reckoned to contain near 3000 Scots acres. " It affords sustenance during the winter to the cattle of the surrounding farms. This remarkable meadow, besides its utility, adds great liveliness and beauty to the general face of the country. The scene it exhibits during the months of July and August, of twenty or thirty different parties of people employed in hay-making, is certainly very cheerful ; and, during the winter, the greater part of it being overflowed by the Carron, which runs through the middle of it, and which is then industriously led over its whole extent, to fertilize it for the ensuing crop, it assumes the appearance of a large and beautiful lake. In both situations, it affords an agreeable relief from the bleakness of the country around it \*."

Immediately after passing Carron bog, the banks of the river become extremely romantic. Clumps of natural wood, chiefly oak, assisted by plantations of larch and Scots fir, adorn the shelving rocks, and give interest to the numerous cascades which are heard tumbling under their covert.

Passing along the Carron, towards Dunipace and Larbert, the soil rapidly improves, from a clayey till to a rich and fertile loam. The country now opens towards the Forth. The extensive carses of St Ninian's, Airth, Bothkennar, Falkirk, and Polmont, meet the eye, presenting a scene, which, for industry, population, and culture, may vie with any in Great Britain. Gentlemen's

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\* See Statistical Account, Vol. II. p. 372.

men's seats, with their ornamented environs ; thriving towns and villages ; important manufacturing establishments ; and especially fertile fields, loaded with abundant crops, and daily improving under the hand of skill and industry, constitute the principal objects in this highly interesting prospect.

If again we take the route by the beautiful valley that opens by Strathblane, and Campsie, to Kilsyth, the richness of the pastures, and the increasing fertility of the soil, offer still more important objects of attention than the Carron Bog and the Dundaff hills.

At its western extremity, this valley is very narrow ; in some places, it is not more than half a mile broad. The soil is chiefly a sharp arenaceous earth. On the banks of the Blane a light loam prevails. The general soil of the mountains has been already described, as consisting partly of peat earth ; but chiefly of a reddish arenaceous earth, and of a stiff till. The native vegetables of these pastures will be afterwards enumerated. The chain of mountains which traverses this district from west to east, declines gradually in height, in that direction, from the Campsie Fells, which are estimated at 1500 feet, by the Kilsyth hills, of about 1300 feet, to Denny, where their character, as mountains, is lost.

The valley that extends from Strathblane towards Kilsyth, is bounded on the south by a low hill, covered in a great part with stunted heath, and terminating abruptly on the east, in the romantic promontory of Woodhead. On the southern slope of this hill lies, with a fine exposure, the parish of Baldernock, containing much land of excellent quality, both loamy and arenaceous : the subsoil abounding in coal and limestone.

Advancing

Advancing eastwards, by Campsie, the valley widens. After passing the promontory of Woodhead, the whole is a continued plain, beautifully undulated with gentle eminences and easy declivities. The general character of the soil is siliceous, or arenaceous, with an admixture of loam. Towards Kilsyth, the grand canal, from time to time, meets the eye, on the southern verge of the county. The great road to Falkirk has its direction in a line nearly parallel to the canal; and frequent marks of commercial activity gratify the traveller. On the Kelvin, to the west of Kilsyth, a rich track of clay loam occurs, which is now held in the highest state of cultivation by Captain Davidson, and of which an account will afterwards be given.

In the neighbourhood of Kilsyth, at Dullater Bog, the highest level above the sea occurs, through which the grand canal passes: it is of 162 feet. It is remarkable (but this may be remarked in similar situations in almost every country in Europe) that, at this highest level, the character of the soil is changed; and that at the point where the Banton-coal-work iron-railway crosses the road, (which appears to be the highest ground in this district, the Kelvin running to the west, and the Bonnie, to the east) the soil, which, to the west, is a rich and clayey loam, becomes, towards the east, thin, channelly, and siliceous.

With regard to the soil of the low grounds, and narrow vallies of the western district of Stirlingshire, it may be observed in general, that every river has formed, in proportion to its extent, a quantity of loamy soil, by its alluvion; and the smaller mountain streams have generally formed, at their *embouchures*, a proportioned extent

extent of gravelly or arenaceous soil. These gravelly soils are, for the most part, extremely fertile : they are well suited to the culture of barley, oats, turnips, and potatoes : they require abundant manure ; and they speedily exhaust it.

The soil of the isolated portions of Stirlingshire which lie on the north of the Forth, consisting of the whole parish of Alva, and of a part of the parishes of Lecropt and Logie, is, in the low grounds, partly clay or carse, and partly loam. The mountains of Alva are entirely green, and covered with rich herbage, with the exception of about 1000 acres of moss, which appear to be irreclaimable, on account of its great depth, and the want of a level by which it might be drained.

*Clay, or Carse.*—The distinguishing soil of the richest portion of Stirlingshire, and perhaps of Scotland, is its clay-soil, here usually denominated *carse* or *kerse* land. This remarkable soil extends along the banks of the Forth, in this county, from the neighbourhood of Buchlyvie on the west, to its junction with Linlithgowshire on the east ; through an extent of about 28 miles. Its breadth varies from  $\frac{1}{2}$  mile to  $4\frac{1}{2}$  miles ; the average breadth may be about 2 miles, making 56 square miles, or 28,500 Scots acres of carse soil nearly. If all the carse lands, which skirt the Forth on both sides\*, be taken into the account, it may be computed at the average

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\* That is, in the counties of Perth, Clackmannan, Linlithgow, and Stirling.

rage length of 34 miles, by 6 in breadth; amounting to 204 square miles, or 10,8800 Scots acres nearly, and unquestionably constituting the richest and most important district of Scotland, in an agricultural point of view.

This soil is evidently alluvial; and the substances which are found in it, as well as the aspect of the higher grounds by which it is bounded, indicate that, at some former period, it was covered by the sea. The soil itself consists of the finest particles of earth, without the smallest stone or pebble except what may have been accidentally carried thither. The soil of the best quality, when first taken up from its bed, is of a bluish colour, and of a soapy or mucilaginous consistence. That which has been long exposed to the sun, and to the elements, by cultivation, assumes a darker hue, or hazle colour; and, in point of friability, approaches to the character of loam. Beds of shells, particularly oysters, and others which are usually found in the Firth, occur from time to time, from a few inches to four feet in thickness. Throughout the whole of these corses, patches of till occur, especially in the district to the westward of Stirling. Indeed, as we ascend the Forth towards the west, this soil becomes gradually of inferior quality. These corses are elevated from 12 to 20 or 25 feet above the level of the sea at high water.

At the same time that it is evident that this soil is alluvial, there seems to be room to question whether this deep and extensive tract of clay, stretching along both sides of the Forth, is to be attributed solely to the deposit of that river through the course of ages. The cause appears to be altogether inadequate to such a prodigious

digious effect. The Clyde, which runs through a course at least as long, and carries an equal body of water to the sea, has formed no alluvial land at its embouchure; and it will probably be found that no river that runs westward has, by its alluvion, formed any considerable deposit of soil. The quantity of earthy particles that are carried down by rivers and streams from the mountains is much less than has been generally imagined.

It would seem, that at some distant period, the waters of the German Ocean had regurgitated to the westward, and covered, for a considerable time, those plains \*, depositing there the rich particles of soil with which they were, in consequence of some revolution of nature, copiously impregnated. If any stress could be laid on the universal tradition of the country, it would lead to the belief that this whole plain, as far west as Gartmore, was formerly covered by the sea †.

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\* The same observations apply to the Carse of Gowrie, in Perthshire.

† It may be permitted to observe that all the phenomena of the carses may be easily explained, by adopting the theory of the ingenious Mr Kirwan, concerning the deluge; which he supposes to have been brought about by the supernatural pouring in of the waters of the Pacific Ocean towards the North-east. In this direction, he remarks, that we find the summits of all the high mountains in the world broken over and tumbled down; we find the south-west side of the rocks and mountains washed bare, and an accumulation of soil on the east or north-east. Leaving this theory to its own merits,  
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Every appearance which this district exhibits seems to confirm this belief. The depth of the soil is very great; in some places, it is 30 feet and upwards. In digging a coal-pit, on the estate of Carron-hall, the slimy earth, or sleet, as it is here called, the same in consistence with that which covers the Firth at low-water, was found at the depth of 26 feet; it burst in upon the pit, crushing the wood of three inch plank, which was employed to line it; and it was found necessary to line it with stone. In the Carse of Gowrie, a stratum of peat-moss

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it may be noticed that it is on the eastern side of every continent that we meet with extensive tracts of alluvial soil. Sir George Staunton informs us, that, on the eastern coast of China, there is an extent of 200 miles of this soil: we find a tract of the same extent on the eastern coast of America; we meet with it, on a smaller scale, in the carses of Perthshire and Stirlingshire.

If Mr Kirwan's theory be adopted, does it not follow, that when the dashing torrent from the S. W. of which this globe every where exhibits such striking traces, had reached any sea which lay in its course, the German Ocean, for example, a considerable time must elapse before it could communicate its impulse to the waters which it found at rest; that, during this suspension of motion, it must have regurgitated on the land which it had left behind it; and that even some centuries may have elapsed before the waters regained their ancient and their present level? During this interval, the ocean, loaded with the spoils, vegetable and terrene, of the continents which it had swept in its course, would gradually deposit on the coasts to the north-east the rich materials which it had carried along with it.

moss is found 19 feet under the surface, full of the roots of large trees, deer's horns, and large bones (all probably antediluvian) in the superior strata no vegetable exuviae are found; they consist solely of particles of fine earth \*. In the Carse of Falkirk, there has been lately found, under a covering of moss, a bed of clay marle, 6 feet thick, and below that another bed of moss.

The nearer the sea, it is observed, that the better and deeper the carse soil is. All along the coast of the parishes of St Ninian's, Airth, Bothkennar, Falkirk, and Polmont, the Firth is so shallow that an extensive tract is laid dry at low-water; this has encouraged most of the adjacent proprietors to reclaim many hundred acres from the sea by *embankments*, of which an account will be given under that head. Let it suffice, at present, to observe, that in 1788 Lord Dundas reclaimed 90 acres on the north side of the Carron where it enters the Firth. In 1806, he gained 24 acres in the parish of Airth. In Bothkennar he is now about to reclaim 60 acres, where about 500 more may be easily gained. About 400 acres have been recovered from the sea by other proprietors in this district; and further additions will, no doubt, be soon made, by this process, to the productive soil of Stirlingshire, and of the adjacent counties.

The soil thus acquired from the sea is found to be superior in quality to the rest even of the carse land. The first year, it is fallowed, in order to expose it to the sun and frost, and to bleach out the saline particles with

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\* Stat. Acc. Vol. XIX. p. 557.



which it is too copiously impregnated. After this operation, with an ordinary dose of lime, it will yield the richest crops for upwards of a dozen of years, without any further manure.

*Peat earth or moss.*—The only other species of soil which remains to be noticed in Stirlingshire is peat-earth, or moss as it is called in Scotland.

In the mountainous district, at the western extremity of the county, much of this soil is found, consisting partly of mossy strata of considerable depth, as on the lower part of the eastern shoulder of Benlomond; and partly of a thin superficial covering of peat-earth, incumbent on a clayey till, or gravelly subsoil. Of this last kind an extensive tract occurs, stretching from Drymen, by the higher grounds of Balfroon and Kippen, as far as Gargunnoch; another mossy tract occupies the western part of the parish of St Ninian's. A tract of moss of considerable depth, commencing in the parish of Muiravonside, extends as far as Cumbernauld in Dunbartonshire.

Though a great portion of the shallow mosses are, in some measure, inapplicable to the purposes of husbandry, and though these moorish tracts, through their whole extent, are of inferior value, yet they must not, without many limitations, be indiscriminately classed under the denomination of *wastes*. The greatest part of these grounds furnishes pasture for sheep; the muirs of St Ninian's and Gargunnoch especially are reckoned excellent pasture grounds, as well as those in the western district of the county.

Perhaps

Perhaps the only grounds in Stirlingshire that may be accounted absolute  *wastes*  are the mosses of Muiravonside and Slamannan in great part; the thousand acres of moss in the mountains of Alva, of which mention has been made; and the small patches of deep or flow moss, as it is called, which are found in the lower district of the county, on the banks of the Forth, of which we shall now take notice.

Of this last kind of mosses there are three in the lower part of the parish of Kippen, one of 200 acres, one of 150, and one of about 70. There were formerly some other mosses in this line of country; but these, with a great part of those that remain, have been removed, and they will all be soon removed, in the manner which shall afterwards be described. In the fertile parish of Airth there is a moss of between 400 and 500 acres, of which the late Lord Dunmore cleared away 100 acres upon the Kersie estate; and his son, the present Earl, is now prosecuting the undertaking with increased ardour. All these mosses are incumbent on a clay or carse soil.

That all of these, together with the still more extensive moss of Blairdrummond, in the county of Perth, and on the northern bank of the Forth, had their origin in the overthrow of vast forests which formerly occupied this extensive plain, is the generally received and probable opinion. There is even reason to believe, were this the proper place for discussing the point, that this forest formed a part of the *Sylva Caledonia*, which was cut down in the time of Severus, by the Roman soldiers, in order to deprive the natives of those fastnesses from which they used to sally forth to annoy the legions.

These mosses consist of two strata, the upper one is formed of a light spongy peat earth, of a whitish colour, and extending to the depth of 5 or 6 feet. It is evidently an accumulation of sphagnum, comarum palustre, and other coarse aquatic plants. It is neither useful as fuel or as a manure. Below this is found a stratum of 4 or 5 feet of black compact peat earth, which is used for fuel, and which, when mixed with clay or dung, makes a good manure for a clayey soil. Below these strata of peat, a rich clay soil appears, precisely of the same quality, and upon the same level with the adjacent carses.

On the surface of this clay, the remains of the ancient forest present themselves, and impress the mind with a very striking idea of its magnificence. The remains of birch, alder, willow, and hazle, occur in a decayed state, and are easily removed. But the oaks are almost entire: the *white wood*, as it is called, or the outermost circles of the tree, only are decayed; whilst the *red* remains, and is likely to remain, if not exposed to the air, for ages. These trees are of great length, some of them 60 feet in stem. They lie in every direction, which seems to indicate that they were not overturned by a tempest, but by the hand of man. The roots still remain entire beside them, with their fangs deeply and firmly fixed in the soil. Five or six of these roots may sometimes be found in a piece of ground of not more than 20 yards in diameter; and one is surprised to observe that trees of such magnitude grow so close to one another. A fine specimen of this appearance may be seen below the village of Kippen, on the farm of Mr George Galbraith.

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With regard to the respective number of acres, of each of these different kinds of soil, of which Stirlingshire consists, it is impossible to form a precise estimate.

Considering Stirlingshire as containing about 328,000 Scots acres, the following estimate is probably a near approximation to the truth :

	<i>Acres.</i>
1. The carse soil has been already estimated at	28,500
2. Loamy and arenaceous soil, under cultivation . . . . .	80,000
3. Mountain and valley pastures, partly moorish, including woods, a few small lakes, rivers, roads, towns, and villages . .	202,500
4. Deep mosses, at present waste, including those of Airth, Alva, Kippen, Muiravonside, Slamannan, and the impracticable mosses of Buchanan and Drymen . .	17,000
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Total acres	328,000

Before quitting the subject of the soils of this county, it may be permitted to add, that nature furnishes us with a method of judging of them which, though little attended to, might be turned to good account by the agriculturist ; and this is by the native vegetables which soils of a particular quality are disposed to produce. Indeed, it may be observed, that a moderate and easily acquired, but *scientific* acquaintance with the native plants of his country, is more necessary to the husbandman than even to the apothecary. A few examples which

which occur every day to an observer in Stirlingshire will serve to illustrate this topic.

Land that is mossy, or the subsoil of which is moss, naturally produces the *eriophorum*s, *carex*es, *droseras*, and *anthericum ossifragum*, with the different kinds of heath.

Spouty and wet soils produce the *pinguicula*, the *viola palustris*, *triglochin*, water cresses, *bidens*, *caltha*.

Land, the subsoil of which is tilly, and impervious to water, may be known by the abundant production of *junci* of various kinds, particularly, on elevated situations, the *juncus articulatus* or *spret*.

Thin and exhausted soils, held in cultivation, produce the *rumex acetosella*, or sheep's sorrel, the *geranium dissectum*, *achillea ptarmica*, &c.

Many soils in this district, and probably over all Scotland, that are naturally of good quality, but let out in grass in an impoverished state, are over-run with the *serratula arvensis*, the too well known "cursed thistle," the *onopordum*, still more pernicious where it fixes, but happily not so abundant; and the *senecio jacobea*, or rag-weed. Even the *habis* of this last may serve, in some measure, to indicate the quality of the soil. Wherever it grows tall and luxuriant, the soil is good; wherever it is low and stunted, the soil is poor.

In the fine carses of Falkirk, Botolphcraigh, and Airth, the introduction and dissemination of the *tussilago farfara* is noticed and regretted by the most intelligent agriculturists with whom the reporter has had an opportunity to converse; and they will forgive his embracing this occasion of attempting to put them upon their guard against its pernicious qualities. The root of this plant is of such a nature as to render it almost inexterminable.

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It is broken over by the smallest impulse; the least portion of it, left in the ground, becomes a new plant; it belongs to the *syngenesia* class; and its seeds are very numerous. They are furnished with wings (pappus) by which they are easily conveyed, by the winds, over a great space. The leaf is broad, and covers much ground. The clay soil, too, is the proper nidus of the tussilago.

It is difficult to say what is the most promising method of exterminating this noxious plant. To attempt it by removing every fragment of the root from the soil seems to be impracticable. The most successful method, reasoning analogically, probably is to nip off the flower attentively, before it has ripened the seeds; the multiplication of the weed will be thus prevented; and by successive preventions of perfecting the seed, the plant will at length die.

Light loamy soils, on the banks of rivers, may be marked in early spring, by a scanty verdure, and by the abundant appearance of the *equisetum arvense*.

Thin soils, which have been laid down in bad order, may be distinguished by the almost total failure of plants useful for pasture; and by the prevalence of vegetables of the musci order, as *polytrichums*, (perhaps the mark of the very poorest soil) *mniunes*, *bryum*, and *hypnum*.

Were a character to be offered of the *best pasture soils* of this country, by an enumeration of the native vegetables which they generally produce, the reporter would presume to suggest the following, nearly in the Linnaean order; premising that it is the *quality* of the soil, and not the *value* of the plants that is *principally* meant to be indicated:

Of

<i>Of the Grasses.</i>	The Tormentilla,
The Anthoxanthum,	Ranunculus ficaria et
Aira,	acris,
Poa,	Thymus,
Festuca,	Euphrasia,
Alopecurus,	Melampyrum,
Holcus, &c.	Lathyrus,
<i>Of other Plants.</i>	Orobis tuberosus,
The Plantago lanceolata,	Vicia,
Galium,	Various trifolia,
Lithospermum,	Polygala,
Bunium,	Hieracium,
Primula veris,	Hypochaeris,
Campanula,	Lapsana,
Linum catharticum,	Gnaphalium dioicum,
Oxalis.	Bellis perennis.
Lychris dioica et flos cuculi	Orchides variz.

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#### SECT. V.—MINERALS.

THERE are few districts in Scotland that abound more in minerals of various kinds than the county of Stirling. Great and valuable as its surface produce is, it may be questioned whether the produce of its subterraneous treasures are not nearly equal. The riches and abundance of its minerals have given occasion to the establishment of many important branches of manufacture which add considerably to the national wealth.

1. *Coal*.—This important mineral may be considered as the basis of national improvement and of arts.  
Wherever

Wherever this fuel abounds, comfort prevails, and manufactures encrease. To render sedentary occupations practicable upon a large scale, warmth is necessary; and if we have surpassed the nations of the Continent in manufactures of every kind, it is to the abundance and general diffusion of coal over our island, that our success is to be, in a great measure, attributed.

The northern boundary of that great belt of coal which extends from Kintyre on the west, to Fifeshire on the east, in an oblique direction, appears to run in this county along the southern base of that chain of mountains which has been described under the appellation of the Lennox hills, and which re-commences beyond Stirling, in the Ochills. To the north of this range of mountains, coal has not been discovered, though repeated trials have been made. One may be mentioned in particular, which was made several years ago, with great attention, by Peter Speirs, Esq. of Culcruich, about a mile to the northward of Culcruich house. The appearances of the strata were very favourable; but after boring to the depth of about 32 fathoms, no coal was found; and no further search was made\*.

There is a tradition prevalent in the western parts of the county, that, about a century ago, a trial for coal was made near Buchlyvie, on the estate of Mr Graham of Gartmore; that the miners actually found coal; but  
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\* Whilst this report is in the press, the author learns that Mr Speirs is engaged in a further trial, with some prospect of success: of this, he hopes to be able to give some account in an Appendix.



that they were bribed by the laird of Bannockburn to conceal their discovery, lest his own sales might suffer by it. After some enquiry, the reporter can find no just foundation for this tradition.

The parishes which lie to the north and west of this line of coal, lie under great inconvenience from the distance and high price of fuel.

To the south of this line, coal abounds almost everywhere. It is impossible, in such an extensive range of this useful mineral, to ascertain the quantity or the value of what is raised. Some documents to shew its quality and abundance in different districts of the county must suffice.

To begin by the west, there is a valuable coal wrought in the parish of Baldernock; the seam is from 3 to 4½ feet in thickness. It lies between two strata of limestone; the upper one blue, and of fine quality; the under one whitish, and of less value. This coal resembles that of Newcastle.

The parish of Campsie has long been celebrated for the abundance and quality of its coal. The disposition of the belts of coal in this parish is somewhat remarkable. A mile to the eastward of the church, at the base of the Campsie hills, one belt of about 1000 yards in breadth commences, and is continued to the eastward through the whole extent of the parish. Another belt, of still greater extent, encircles the lesser hills, or eminences to the south. The coal of the latter is of a superior quality to the other.

In the northern belt, the coal is found at the depth of from 7 to 15 fathoms; in the southern, from 15 to 22 fathoms. The ordinary thickness of the seams is  
from

from 42 inches to 16 feet. The adjacent strata mostly resemble those of the Bannock coal-works; except that here, between the upper stratum of limestone (which is 4 feet in thickness) and the coal, there is found uniformly a stratum of schistus or slate, from 4 to 15 feet in thickness. A white limestone, of inferior quality, is found, as before, below the coal. The dip of the seam of coal, inclining, in general towards the south east (which is the dectid inclination of the ground) is from one foot in three, to one foot in twenty.

The Campsie coal contains a great proportion of sulphur: it cakes, or runs into bne mass, in the chimney: it lasts long; but it does not burn with so bright a flame as the coal of Bannockburn.

In 1798, it was estimated that above 20,000 tons were raised annually from the Bannockburn pits; and that, at that rate, three acres of the subterranean seam were annually exhausted; and it is not improbable that this calculation was just. It may be affirmed at present, that from the erection and enlargement of villages, and from the rapid extension of various manufactures in the neighbourhood, more than 40,000 tons are annually raised, a circumstance which seems to threaten, at no very distant period, the total consumption of coal in this district. But it is certain that coal abounds to a much greater depth than any of these mines have been hitherto carried; and that by the perfection to which steam engines, and other necessary machinery, have been brought, the coal can be got at far below the levels that are now wrought.

The parish of Kilsyth abounds in coal. That which is found in the west barony is of very superior quality.

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The Panton coal, which is found in the East Barony, is what is called a *blind coal*, and bears a near resemblance to the Kilkenny coal. It contains little or no sulphur; and but a very small proportion of bituminous substance. This coal is found to be the most proper of all others for smithy forges; for furnaces; and for all metallurgical operations, where there should be little smoke or flame. Accordingly, it is exported in great quantities, by the canal, from which it is distant only about a mile, to England, to Ireland, and formerly to Russia. This important mine is much incommoded with water, which is carried off with a great expence of machinery; but as the machinery is of the very best construction, it is found effectual to remove the evil completely.

All the coal that has been hitherto wrought in Kilsyth lies, as in Campsie, near the surface, from 4 to 16 fathoms. There is no doubt that it extends to a yet greater depth; and that, at some future period, it will become necessary to work it by the assistance of steam engines.

In the parish of Denny, in the same tract of country, coals are found in sufficient abundance to supply the inhabitants and the adjacent country. From Banknock coallery, much coal of excellent quality is exported to Glasgow by the canal. 12 cwt. of this coal is laid down at Denny for six shillings.

The parish of St Ninian's, throughout its whole eastern district, abounds with coal; and there, coalleries are carried on upon a very extensive scale. Those of Bannockburn, Auchinbowie, and Pleanmuir, are the most ancient, and perhaps the most frequented; new pits

pits are opened up from time to time. It is a consolatory consideration to Scotland that the coal of this district seems to be inexhaustible. Its quality too is of a very superior kind. It burns with a bright flame; emits great heat; and is impregnated with a very small proportion of sulphur. The coal of this district supplies the southern parts of Perthshire, and the northern part of this county; besides its own immediate consumption, and a considerable exportation by the Firth.

In the parish of Airth, there is a coal of excellent quality found under the rock, in the hills of Airth and Dunmore, as well as in the flat fields around. It is only in the hill of Dunmore that coal is taken up at present; the seam is from 3 to 4 feet in thickness. It was on the Dunmore coalliery that the *second* fire engine was erected in Scotland.

Coal abounds every where in the parishes of Bothkennar, Falkirk, and Polmont. It is found also in Mairavonside. Besides the Dunmore coalliery, there are extensive works on the estates of Mr Bruce of Kinaird, and Mr Dundas of Carron-hall. The coals are of excellent quality, and are sold from 8 to 9 shillings per ton. Besides supplying the numerous and populous villages and manufacturing establishments in the neighbourhood, a very considerable quantity of coals is exported from this last mentioned district. From Mr Dundas's pits alone are generally shipped, at Carron shore, about 30,000 tons. They are carried from the pit to the shipping place by an iron rail-way which originally cost L.700 per mile. Before this rail-way was constructed, the rate of carriage to the shore was 1 shil-

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ling per ton : they are now carried for 2 pence per ton. Thus the saving of carriage to the shore, for one year, may be estimated at L.1250.

In the parith of Polmont, the Carron company hold a coal-work in lease at the annual rent of L.1,200 \*.

*Limestone.*—This mineral, so essential to agricultural improvement, abounds in the southern and eastern districts of this county. In many instances, as has been stated already, it accompanies coal in two strata, the one above the coal, and the other below ; the former being always of the best quality. The lime-works of Campsie and Kilsyth, and those of Sauchie and Murray's-hall, in the

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\* The reporter has to regret that in investigating the coal works of this county, which occupy such an important part in its internal economy, as well as in his enquiries concerning some of its great manufacturing establishments, he has experienced, for the most part, a jealousy of the object of these inquiries to which no circumstance in the conduct of the Board of Agriculture, or, as he hopes, in his humbler researches, could possibly give rise. A more enlightened view of the object of these reports will soon dissipate these unfounded alarms ; and the liberal conductors of these establishments will take pleasure in diffusing every information which may tend to benefit their country. Information concerning peculiar and secret processes, it would be improper to require, and unreasonable to expect. It may be perhaps accounted singular, that in the landed agricultural interest, no traces of this jealousy have occurred.

the neighbourhood of Stirling, have been long celebrated for the quality as well as the quantity of lime which they produce.

Lime-shells, or calcined lime, is now sold at Baldernock, Campsie, and Kilsyth, by the chalder of 32 firlots, wheat measure, at the price of 19 shillings per chalder.

At Sauchie and Murray's-hall, it is sold by the chalder of 24 firlots, pease measure \*, for 15 or 16 shillings per chalder. The quality of the lime at all these places may be judged of by adding, that when fully slacked, it doubles its bulk.

The eastern district of Stirlingshire, on the Firth of Forth, is chiefly supplied with lime, by water carriage, from Lord Elgin's works on the opposite coast. The present price of lime shells at these works is 1s. 6d. per boll, of 4 firlots, pease measure, or a trifle more than 4 Winchester bushels; it is put on board at that price free of expence to the purchaser; and from this price there is a deduction given of 10 per cent. for ready money. The freight to the landing places on the coast below Falkirk, and in that neighbourhood, is 6d. per boll. The expence of lock-dues, and landing, is about 10 per cent. of the prime cost.

*Free-stone.*—Freestone, of various quality and appearance, also abounds in Stirlingshire. It frequently accompanies coal and lime-stone. In the western parts of

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\* The firlof of pease-measure contains 24 Scots pints.

the county, a reddish free-stone is found in plenty, which is easily wrought ; but its appearance in buildings of any elegance displeases the eye ; this is removed by painting, or casting them with lime.

The free-stone of Kilsyth is of a remarkably fine quality, its general colour is a beautiful white ; but it is sometimes tinged with various shades of brown and yellow, and adorned with delicate vegetable impressions. When taken from the quarry, it is soft and easily wrought ; but, by exposure to the air, it gradually hardens, and becomes susceptible of a fine polish. It is held in high esteem, not only for the pavement of streets, but also for ornamental work, as vases, columns, and fretted work. Its vicinity to the great canal renders its conveyance to Glasgow easy and cheap ; and it is accordingly conveyed thither in great quantities.—When its value becomes better known, the demand for it will undoubtedly increase from the most remote parts of the kingdom. The stratum or post, as it is here called, of this quarry, is from 10 to 15 feet thick, and may be considered as inexhaustible.

*Iron-stone.*—Iron-stone, which is found in various places in Scotland, as well as in England, occurs in Stirlingshire in inexhaustible quantities. There is, indeed, no reason to doubt that this circumstance, together with the abundance of coal, and the convenience of water carriage, was the chief motive for determining the site of the *Carron works*, the distinguishing manufacture of this county. Indeed, it is said, that the ingenious Dr. Roebuck, one of the first projectors of these magnificent works, after having examined the greatest part of the

the island, before he made his choice, fixed upon this spot as the most convenient. The propriety of his choice is unquestionable.

Besides the supplies of iron-stone which the company receives from England and from Fifeshire, they receive great quantities from the parish of Kilsyth by the canal. Mr Kincaid of Kincaid, in Campsie parish, furnishes annually 8000 tons by contract with the company. Iron-stone is also found in the parishes of Baldernock, Denny, and Muiravonside. To obtain an estimate of the quantity of this mineral annually furnished by this country is impossible. The veil of secrecy which is thrown over this important manufacture appears to be impenetrable; and perhaps, in some points of view, it ought to be so.

Before quitting this part of the subject, however, it may be proper to take notice of a particular species of iron-stone which is found upon the estate of Sir Charles Edmondstone, in the parish of Kilsyth; and which is considered as the most valuable of all others. It is called ball-iron-stone. The balls, or rounded masses of which it consists, are uniformly of the same shape, which is that of a flat topped loaf, or apple pudding.— They are of all sizes, from a quarter of an inch to a foot in diameter. When broken, or cut asunder, they exhibit within a variety of partitions, which are generally filled with spar; though they are sometimes empty; and excavated like a honey-comb. They are the richest in ore of any that are found. They are disposed in strata at unequal distances. The balls of each stratum are, for the most part, of the same size; those of the uppermost strata, smaller; those of the lower, larger.



*Basaltes.*—This species of rock occurs in Stirlingshire in great profusion, and in great perfection. Indeed, it may be remarked that the rocks throughout that whole line of mountain which extends from Dunbarton to Stirling, partake more or less of the basaltic character. It appears, in some places, in a state of perfection and beauty which is surpassed only by the wonders of Staffa. There is, in particular, in the parish of Fintry, “a grand range or colonnade of basaltic pillars, which rise in a hill called *Dun*, at the end of the hill of Fintry. It consists of 70 columns in front of a gigantic stature; some of them separating into loose blocks, and others, apparently without joint, from top to bottom. They stand perpendicular to the horizon, and rise to the height of 50 feet. Some of them are square, others pentagonal and hexagonal. On the east side of the range, the columns stand separated from one another by an interstice of 3 or 4 inches.—These interstices gradually lessen towards the west, till nothing but a seam is discernible; and then, all is blended in one solid mass of rock, which is much honey-combed, and has the appearance of having been ignited \*.”

*Granite.*—Granite has always been considered as one of the mineralogical productions of Stirlingshire. A seam of stone, in Kilsyth, from 20 to 30 feet in thickness, of which many thousand tons are annually conveyed to Glasgow by the canal, for paving the streets, has

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\* Stat. Acc. of Fintry, Vol. XI. p. 382.

has hitherto been denominated *granite*. The mineralogical knowledge of the reporter does not enable him to say whether this rock be true granite; or that species of stone, which Dr Thomas Thomson of Edinburgh would term *Syenite*, from its being of the same composition with the rocks of Syene in Upper Egypt, of which so many celebrated monuments still exist. It is probable that this rock is syenite.

In the Halestain burn, in the parish of Kilsyth, the celebrated German mineralogist, M. Raspe, found large masses of gray and variegated dull coloured flint; yellow and red jasper, with nodules of agate and porphyry. This jasper, which is of a very fine grain, has long ago found its way to the lapidaries and seal engravers of Edinburgh and London \*.

**METALS.—Copper.**—In 1791 Mr Raspe examined a vein of copper in the parish of Kilsyth, which had been wrought about 60 years before by the *York Building Company*. He found in the drift that had been wrought “a vein of reddish heavy spar, or vitriolated barytes.” Upon entering the mine, which, he observes, “had been preposterously shut up,” he found promising appearances of copper: and, it may be added, that the opinion of such a skilful mineralogist surely furnishes a strong encouragement to proceed in the research.

Copper has also been found in the Ochil hills in this county. In the parish of Logie, a copper mine was  
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\* Stat. Acc. of Kilsyth, Vol. XVIII. p. 225.

wrought; some years ago, with great prospect of success. The hopes of the undertakers were, at one time, encouraged by meeting with a very rich vein; but, after working for some time, it disappeared; and the search for copper has been abandoned.

*Silver and Cobalt.*—Silver ore has been found in the parishes of Logie and Alva. On the estate of Aithrey, now the property of Sir Robert Abercromby, in the years 1761-2-3-4, a company of gentlemen from England, in copartnership with the proprietor, wrought a silver mine, from which were extracted 50 barrels of silver ore, of which 4 barrels made a ton; and each ton was valued in London at L. 60 sterling. One Dr Twisse, to whom the ore was consigned, becoming bankrupt, the adventure was abandoned.

In the parish of Alva, a very valuable vein of silver was discovered about the commencement of the last century, by Sir James Erskine of Alva, in the glen or ravine which separates the *Middle-hill* from the *Wood-hill*. It made its first appearance in small strings of silver ore, which, being followed, led to a large mass of that metal. A part of this had the appearance of malleable silver; and was found upon trial to be so rich as to produce 12 ounces of silver from 14 ounces of ore. Not more than L. 50 had been expended when this valuable discovery was made. For the space of 18 or 14 weeks, it is credibly affirmed that the proprietor obtained ore from this mine to the value of L. 4000. per week. When this mass was exhausted, the silver ore began to appear in smaller quantities; symptoms of lead, and of other metals, presented themselves; and the

the search was, for the present, abandoned. The communion cups of the parish of Alva are made of this native silver.

About the year 1759, Charles Erskine of Alva, Lord Justice Clerk, in company with some other enterprising gentlemen, renewed the search for silver ore in these hills with considerable industry and exertion. The course of the vein was pursued a great way beyond the old workings. A shaft was made to the depth of several fathoms, immediately below the waste, from which the rich mass of ore that has been mentioned was taken, and a drift carried on upon that level in the direction of that vein. None of these operations, however, were, on that occasion, accompanied with success. But in driving a level, at a considerable distance, nearer the bottom of the hill, for the purpose of carrying off the water from the works that were situate above, a large mass of *cobalt* was discovered, a great part of which was employed in a manufacture of porcelain which had been established about that time at Prestonpans in East-Lothian. When this cobalt is deprived of the *arsenic* with which it is strongly impregnated, and otherwise properly prepared, it produces a powder of a beautiful deep blue, with which a variety of useful and ornamental pieces of china and glass have been coloured. There is, indeed, reason to believe that the cobalt of the hills of Alva is, in no respect, inferior to that which is procured from the mines of Saxony.

Very considerable quantities of cobalt were, at the same time, extracted from the heaps of rubbish which had been thrown out 50 years before by Sir James Erskine in working his silver mine.

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The working of all these mines has been for some time abandoned; but during the period that they were wrought, a very accurate survey of the different veins of metals which had been discovered was made by an agent of the company, who was well qualified for the task. From this survey, or register, it appears that there are in the parish of Alva no fewer than 14 or 15 mines containing lead, copper, iron, cobalt, and silver\*. It is to be hoped that these subterranean treasures, which promise to add so considerably to the national wealth, will soon be more successfully and completely explored.

At the Spout of Balagan, in Strathblane parish, where, in a perpendicular rock of 70 feet, over which falls a magnificent cascade, no fewer than 192 alternate strata of earth and lime-stone present themselves, are found some thin strata of alabaster of the purest white. There were also found near the same place, amongst the rubbish thrown up by an inundation, some rich specimens of antimony†.

SECTION

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\* This account of the mines of Alva is abridged from the Stat. Acc. Vol. XVIII. p. 140, &c.

† Stat. Acc. Vol. XVIII. p. 578.

## SECT. VI.—WATER.

STIRLINGSHIRE is abundantly supplied every where with water, from *streams* and *rivers*, from *lakes* and *ponds*, and *springs*. This is what might be expected in a mountainous district narrowly circumscribed by two seas.

To begin again by the west, this county is bounded, through about 15 miles of its extent, by Lochlomond, the noblest and the most beautiful of the lakes of Britain. This lake, emptying itself into the Clyde by the Leven, affords a convenient conveyance, by vessels of little draught of water, for the valuable wood and oak bark that is annually sent to market from the upper parts of Stirlingshire, as well as for the wool that is produced on its mountains; and the inhabitants of these districts receive, in return, coal and lime, and the productions of the low country. Lochlomond is above 100 fathoms in depth at the base of Benlomond, and about 22 fathoms towards the lower extremity, as the reporter had an opportunity of observing, many years ago, in accompanying his much respected friend Dr Stuart of Luss, whilst sounding amongst the islands of this lake.

Besides Lochlomond, there are several small sheets of water interspersed throughout Stirlingshire, which, though of an inconsiderable extent, serve to give diversity to the scene. The superficial extent of all of these

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put together does not exceed 1,300 Scots acres. The most considerable of these small sheets of water are Loch Coulter in St Ninian's; a piece of water in the muirs of Slamannan; Bardowie loch in Baldernock; the canal reservoir at Kilsyth (which is of 70 acres) the loch of Antermoney, &c.

This county is most copiously watered by rivers and streams. The Forth has its source in this county from a spring in the northern side of Benlomond, near the summit of the mountain. It traverses Stirlingshire for 10 miles from its source, under the appellation of the *Water of Duchray*, augmented, as it proceeds, by numberless mountain streams. It then enters into Perthshire, where it receives an accession equal to the volume of its own waters, in the river which issues from Lockhard in Aberfoyle. It there assumes the name of the *Avendow*, or Black River. After a course of about five miles, it again joins Stirlingshire below Gartmore house, where it obtains the name of *Forth*, which it henceforth retains.

From this point, the Forth uniformly bounds the county of Stirling on the north, except in the few instances, that have been noticed, of some isolated tracts which lie to the north of that river.

A few miles above Stirling, the Teath or Teith, the Taichus of the historian Buchanan, and the Avon Thaich of the Highlanders, a large and beautiful river rising in Perthshire, notwithstanding its undeniable superiority, sinks both its waters and its name in the Forth.

As far as Stirling, the river is navigable to vessels of about 70 tons burden; but this navigation is rendered extremely inconvenient by the numerous windings (here called

called *links*) of the Forth. The line of the river from Alloa is reckoned near 20 miles; whilst the distance, in a direct line, is scarcely seven.

After a course of about 7 miles from Stirling bridge the river stretches out into a firth of several miles in breadth, affording facilities for navigation, and for commerce, upon an enlarged scale. The sea-port of Grangemouth, especially, situated in the most favourable position for the navigation of the German seas, as well as for its communication with the Atlantic by the great canal, promises to rise into a high degree of consideration and opulence.

The river Carron, famed in Celtic antiquities, has its rise in the parish of Fintry; and, after taking its course through the parishes of Denny, Larbert, Bothkennar, and Falkirk, empties itself into the Forth at Grangemouth. The Carron, at full tide, is navigable for vessels of 200 tons burden, as far as the village of Carron-shore, the shipping place of the Carron company, in the vicinity of the iron-works, and less than two miles from its confluence with the Forth. By the river Carron, from Carron-shore the most important facilities are afforded to the company for importation, and for exportation.

In the same parish of Fintry, at no great distance from the source of the Carron, the Eddric has its rise, running westward through the parishes of Balfron, Killearn, (where it receives very considerable reinforcements from the Blane, the Duilt, &c.) Drymen, and Buchanan, it falls into Lochlomond to the westward of Buchanan house, the seat of the Duke of Montrose.

The Kelvin has its rise in the parish of Kilsyth; it is augmented in its course by numerous mountain streams,



as the *Red-burn*, and the Luggie from the south; the Shaw-end, the Colzeum, the Garrel, and the Glassert, from the north \*. This river, running westwards, in a line nearly parallel to the great canal, through this county, for about eight miles, and approaching the canal by the distance of, from a few yards to a mile, enters into the county of Dunbarton, and falls into the Clyde, at the village of Partick in Lanarkshire, after passing under a magnificent aqueduct bridge, which receives the great canal in the neighbourhood of Glasgow.

All these rivers and lakes produce the different kinds of fish that are to be found in the lakes and rivers of Scotland. The lakes abound in trout, pike, perch, and eels. In the Forth, salmons are caught; but it is observed that they are not nearly so numerous in this river, ever since the operations of removing the Blair-drummond moss have begun to be carried on upon such an extensive scale. By the masses of peat-earth which are floated down in such quantities the river is rendered turbid, and the fish are prevented from ascending. But it may be permitted to observe, that whatever the injury may be that is suffered by individuals in this *temporary* defalcation, the political calculator will have little difficulty in determining between the

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\* A short note may be admitted, to remark that almost all of these names are of Celtic origin; Kelvin, *i. e.* Caol-avon, the narrow river; Kilsyth, *i. e.* Caol-suidh, the narrow recess or stripe; Garrel or Garvall, *i. e.* the Rough-burn; Glassart, or Clais-ard, the High-ravine, &c.

the permanent advantage of adding many thousand acres of rich soil to the agriculture of the country, and the transient suspension of even a profitable fishery.

The Firth of Forth is annually visited by shoals of herrings, which afford a seasonable and grateful relief to the poorer orders of society. The herrings do not arrive in the Forth so early as on the western coast of Scotland, on account of the greater length of their course by the German sea. The fishing, accordingly, does not commence till harvest; and the fish, too, are of an inferior quality.

Salmons are caught in considerable numbers in Loch-lemond, particularly in the vicinity of the mouth of the Endric; and there, is no doubt that they would be still more abundant in that lake if a free communication with the sea were afforded by the Leven. There, however, in consequence of the exclusive privilege of the proprietors of the fishing, most of the fish are intercepted. None can reach the lake, except a few that pass by accident; or those that get up during the short period that intervenes between Saturday night and Monday morning, when the river must, by law, be left free.

It seems to be a great hardship to the proprietors of the banks of that beautiful lake, extending about 30 miles to the northward, to be deprived by the monopoly of the Leven of the valuable fishings which they might enjoy on their respective shores. In former times, when these municipal regulations were established, the principles of political economy were little understood. Good sense, and a proper regard to the general interests of the district, would seem to dictate, that, as the lake feeds the Leven with its waters, the  
Leven

Leven should return to the lake the treasures which it derives from the sea ; that the proprietors on the banks of the Leven should have a right to fish upon their own properties in the ordinary and occasional way of angling or drawing a net ; but that, at no time, or on any occasion, except when actually engaged in fishing, they should have a right to interrupt the communication between the lake and the sea.

In the inferior rivers of this country, there is no restriction or exclusive privilege with regard to fishing. The Endrick and the Carron have been long celebrated as streams very favourable for angling.

The salmon fishery at Stirling brings to the town a revenue of between 12 and 1,400 pounds. The fish are sent chiefly to the London and Edinburgh markets.

## CHAP. II.

## STATE OF PROPERTY.

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SECT. I.—ESTATES AND THEIR MANAGEMENT.

STIRLINGSHIRE presents as great a diversity with regard to the state of property as any county in Scotland. We meet here with every rate of landed income, from L. 40 a-year to L. 10,000. It does not seem necessary, nor does it appear usual, in drawing up these Reports for the consideration of the Board of Agriculture, to give a particular enumeration of the different proprietors of land, and of the annual returns of their estates. The *valued* and the *real* rent of the county will be afterwards stated, by parishes, in authentic tables.

There are in this county noblemen, and gentlemen, who possess property within its bounds which brings an-

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nually from L. 8000 to L. 14,000 ; amongst these may be mentioned his Grace the Duke of Montrose, Lord Lieutenant of the county, Lord Dundas, Sir Charles Edmonstone of Duntreath, Bart. William Forbes of Callender, Esq.

In the intermediate states of territorial property, there are many gentlemen possessed of estates which bring from L. 1000 to L. 4000 a-year. A great number also of respectable proprietors occur, from L. 200 to L. 1000 a-year.—And, with regard to this last class, it may be remarked that they contribute principally to the agricultural improvement, to the wealth, and to the embellishment of this, as well as of all the other districts of Scotland. The gentlemen of this class reside almost universally upon their estates. Their education has been liberal, and their views are enlightened. The necessities of their situation, increasing with the gradually increasing expences of polished life, have prompted them, by forcible motives, to improve their properties by every method in their power. Their knowledge enables them to adopt the means of improvement which are suggested by the advancement of science ; and they are qualified, by their good taste, for adding proper embellishments to their estates.

It is a fortunate circumstance for any country when gentlemen of extensive property, and inspired with a just spirit of improvement, reside upon their estates, and not only direct the amelioration of their property, but actually engage in it themselves. This good fortune the county of Stirling possesses in many remarkable instances. Mr Forbes of Callender, possessing one  
of

of the most valuable properties in the county, resides constantly upon his estate; and has furnished an example of rural economy which, it is hoped, will be very universally followed. Upon his accession to the estate in 1783, he found it almost in a state of nature. Of above 7000 acres in this county, all arable he began by taking 4000 acres into his own immediate occupation. He first subdivided the grounds, throwing that in the neighbourhood of Falkirk into fields of three or four acres; and that at a greater distance into fields of six or seven acres; and inclosing them with hedge and ditch in the common form. The ridges were levelled by five or six ploughings; and the whole was limed at the rate of 100 bolls of Lord Elgin's measure per acre. He took one crop of oats, sowing clover and rye-grass seeds with the oats. The lands were then let in lease. The remaining part of the estate was let to tenants, to be improved by themselves, after the example, and with the aid of the proprietor.

Many other opulent and enlightened proprietors in this county reside upon their estates, and occupy themselves agreeably and usefully in gradually improving them. Amongst these may be mentioned Mr Speirs of Culcruick, Mr Kincaid of Kincaid, Mr Stirling of Garden, Dr Moir of Leckie, Mr Graham of Meiklewood, Mr Ogilvie of Gairdoch, &c. &c. These gentlemen are not only proprietors, but extensive occupiers of land:— and there is no doubt that the improvements which their capital and their intelligence enable them to introduce, will at length open the minds of

their tenants, and prompt them, by every motive of interest, to imitate their example.

It has happened, from various circumstances, that a very considerable portion of this county has been frittered down into very diminutive properties, which have been held for several generations by *seuars* or *portioners*, as they are called.—Previous to the Union of this country with England, land was, in this district, held of little value. It is in the memory of persons still alive, that proprietors had great difficulty in procuring tenants to occupy their lands on any terms whatever. In the western part of the county especially, middlemen were often employed, who took extensive tracts in lease, and let them out to small tenants.

It was not unusual, in those times, for great proprietors to parcel out extensive tracts of land amongst their own retainers and dependents,—and to their heirs for ever, on the mere condition of paying the rent of that time,—which is now only a trifling *feu* duty.

The guardians of the great Marquis of Montrose disposed of much of his land in this manner during his minority; and the Marquis himself afterwards made many similar alienations, in order to enable him to support the royal cause. Alienations of the same kind were made in this county by the Earls of Mar, Menteith, and Glencairn. The Earl of Wigton, who strenuously opposed the Union in 1705, from a conviction that it would prove the ruin of his country, disposed his extensive estates in the parishes of Denny, Kirkintulloch, and Cumbernauld to his own tenants, on the condition of their paying for ever the rents of that time.

Hence

Hence the frequency of small properties, occupied by vassals, holding of a *subject superior* in this county, particularly in the parishes of St. Ninians, Denny, Campsie, Slamannan, and even in the Carse.

In a certain view of political economy, it must be allowed that these small proprietors constitute a very valuable class of men. Possessed of property transmissible to their posterity, they feel within them a spirit of independence, and have a powerful interest in the prosperity of their country.

But, in another point of view, it may be remarked that, from the narrowness of their circumstances, they are deprived of that education which alone can inspire men with liberal ideas, or prompt them to active enterprize. The small proprietor, having no rent to pay, has no stimulus to the improvement of his property. He is perfectly contented to live as his forefathers had done. He leaves his property to his eldest son as he found it; and the rest of his children to provide for themselves in the best manner they can. The condition of the habitations and fields of this class of men exhibits perhaps the justest picture of the rural economy of Scotland, above 100 years ago, that now exists; and in their mode of life and state of mind, we may trace the character of the Scots peasantry of the same period in its greatest purity.

This class of men, however, must, in the progress of society, gradually disappear:—and, if we regard the agricultural improvement of our country, this is a consummation devoutly to be wished.” The rising generation, amongst this order, will, in their intercourse



with their manufacturing and commercial neighbours, remark the superior enjoyments which modern refinement furnishes : the next step will be to wish to share in them. A spirit of enterprize will be excited ; and luxury will make its way amongst them. To support this, they must sell their petty possessions ; and they will be naturally led to engage in active life.

With regard to the management of estates, the higher class of proprietors, almost in every instance, employ chamberlains or factors ; though there are instances of gentlemen of very extensive properties doing the whole of their own business themselves. Mr Forbes of Calander manages the whole of his extensive estates in Stirlingshire, Ayrshire, and Dumfriesshire, without any assistance.

The chamberlains or factors of gentlemen of great properties are generally gentlemen who had been bred to the law ; but who, from particular circumstances, had been led to pay attention to agriculture, and even, in many instances, to practise it. A mere Edinburgh man of business, however skilled in accounts, and in the law of the land, is a very inadequate judge of the detail of agricultural affairs ; and where such only are employed, neither the interest of the proprietor or of the tenant can be duly consulted. But when, to a thorough knowledge of agriculture, and of country business, there is joined an acquaintance with the law of the land, the advantage is great, in facilitating the transactions of the estate, and in preventing unnecessary litigation.

## SECT. II. TENURES.

IN Scotland, all the land is, according to the feudal system, considered as the property of the King, or Prince of Wales. These lands the King is considered as having parcelled out to the proprietors by charter and investment. All the land thus holds immediately of the King or Prince of Wales, who is accordingly styled the *Superior*. The person to whom the land is conveyed is styled the *Vassal*; and the latter, in the feudal times, owed military service to the former. Those only who hold immediately of the Crown have a right to vote at the election of a Member of Parliament; and they must possess either 400 pounds Scots of valued rent, or 40 shillings on land of *old extent*, as it is called.

In Stirlingshire a great proportion of the valued rent is possessed by peers, who are excluded from all interference with the election of the members of the lower house.

A vassal, holding of the Crown, may convey his property to another man, who is then said to *hold of a subject superior*, or by a *base holding*. Of these, there are great numbers in the county of Stirling. Though they are not entitled to vote for a member of parliament, they have a right to sit and vote in the court of commissioners of supply, which regulates the inter-

nal economy of the county, with respect to highways, bridges, and ferries.

A very considerable part of the land of this county is *entailed*. A great part of it is not. Amongst the *entailed* may be noticed the estates of Lord Dundas, Sir Charles Edmonstone of Duntreath, the estates of Gartmore, Polmaise, Culcruich, &c. The estate of his Grace the Duke of Montrose is *unentailed*.

## CHAP. III.

### BUILDINGS.

#### SECT. I.—HOUSES OF PROPRIETORS.

OMITTING the particular description of the buildings which adorn the numerous thriving towns and villages of this county, as in a great measure foreign to an agricultural report, it may be asserted that the houses of proprietors in Stirlingshire may vie, in point of elegance and commodiousness, with those of any county in Scotland. But, even of these, the particular enumeration would seem necessary, and, in some degree, improper. Suffice it to say that, besides the elegant mansions of many great, and even of moderate proprietors, the environs of Stirling and of Falkirk are ornamented with numerous and handsome villas, to which gentlemen, who have been successful in their professional pursuits, have retired, in order to enjoy the sweets of rural life.

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To this limitation of description, however, the magnificence and the embellishments of Buchanan, the seat of his Grace the Duke of Montrose, together with the antique grandeur of Callander House, the seat of Mr Forbes; the one situated near the western, the other near the eastern extremity of the county, may justly claim an exception.

Buchanan house, situated upon the Endric, and in the vicinity of Lochlomond, is surrounded by a lawn and pleasure ground of more than 1500 acres, bearing a nearer resemblance in its extent, and in the disposition of its embellishments, to an English park than any thing that is to be met with in Scotland. Lofty hills, now covered, in a great part, with thriving plantations, form the back ground to the north. The finest lake in Britain, skirted by the towering mountains of Dunbartonshire, closes the prospect to the west. A lawn, sprinkled with oaks and beeches of more than two centuries old, forms the nearer scenery.

Callander house was built by the ancient Earls of Callander and Linlithgow many centuries ago; and it has been partly modernized and rendered uniform by the present proprietor. It is a very magnificent structure; its length in front is 300 feet. The lawn is adorned with aged trees of great size, which, there is reason to believe, were planted by the Earl of Callander immediately after the restoration of Charles II., whom that nobleman had accompanied in his exile.

SECT. II.—FARM HOUSES AND OFFICES,

IN no country where the comfort and accommodation of the farmer are neglected is it possible that his exertions can be spirited or successful. Personal and domestic enjoyment is the grand object which all, from the peer to the peasant, have constantly in view. In this, as in every other respect, the interests of the proprietor, and of the tenant, go hand in hand. If a comfortable dwelling and commodious offices are given to the tenant, not only will the value of the lease be enhanced in the eyes of candidates at the ensuing letting; but even, during the current one, the occupant will engage with more cheerfulness in every operation, and will the less grudge the fatigues of the day, or the annual expence of his improvements, when he considers the snug apartment which awaits him in the evening, and the comfortable accommodations which are provided for the fruits of his toil. By furnishing these accommodations to the tenant, the proprietor increases the value of his estate in a ratio far beyond his expence. The tenements which he builds on the farm may be considered as, in some degree, indestructible; as they ought, in equity, to be maintained by the tenant in the condition in which they were delivered to him, until the end of the lease; and, at that period, we see every day that

that nothing proves a greater inducement to a tenant, having a family, and possessed of some capital, to exceed somewhat the real value of the farm, than the prospect of entering into a lodging of comfort, and even of some elegance; whilst his mind recoils at the idea of a farm perhaps intrinsically superior, but in which he must live for a long term of years in a mean and smoaky hovel.

It is by no means intended that the proprietor should, in thus accommodating his tenants, sacrifice his purse to a mere act of philanthropy. Besides that, it appears that he would find an ample compensation in the competition that would be excited at the end of the lease, there seems to be nothing unreasonable in his requiring 5 per cent. for the money that he had laid out in furnishing these accommodations. In all the conditions of society, a family pays a certain pecuniary rate for the mere article of lodging. Why the farmer should form an exception does not appear.

Without pretending to any thing more than the knowledge of general principles upon this subject, it may be added, that instead of  $7\frac{1}{2}$  per cent. as interest for the money that is sunk in farm buildings (which is the ordinary rate) 5 per cent. has been here suggested; leaving the additional  $2\frac{1}{2}$  per cent. as a compensation for the indispensable obligation imposed upon the tenant, to preserve his tenements in due repair, and to leave them in that state at the end of the lease.

By such an arrangement, it would seem that, the interest of the proprietor, and of the tenant, would be consulted in as equal a manner as possible.

Till within a period of very recent date, the proprietors of this county took little concern in the domestic accommodations of their tenants; but left every one to provide a house and offices for himself according to his inclination and ability. Accordingly, in those days, the houses of the peasantry were wretched huts, thatched with fern or straw; having two apartments only, the one a kitchen, where master and mistress, and children and servants sat and eat together; the other a sort of room, denominated a *spence*, and this only in the better sort of houses, where strangers were occasionally received, and where the heads of the family generally slept. The byre and stable were generally under the same roof, and separated from the kitchen by a partition of osiers, wrought upon slender wooden posts, and plastered with clay. A glass window and a chimney were esteemed a luxury, and were seldom to be met with.

Some edifices on this plan still occur in Stirlingshire; and though they have, in a great measure, disappeared, it must be remarked, that in the richest district of this county, or perhaps of Scotland, the carses on the Forth, the accommodations of the tenantry are, in many instances, of a very inferior kind. This, it may be observed, is chiefly owing to the smallness of the carse farms in general (a subject which will afterwards come under consideration). Where the farm seldom exceeds 30 acres, which is, for the most part, the case, the proprietor cannot afford to erect costly buildings; nor does the condition of the tenant seem to furnish any claim to much elegance of domestic accommodation. The houses, accordingly, are mostly low, small, and uncomfortable;



able; few are thatched with slate; and still fewer are of more than one story high.

Besides the smallness of the farms in this district, there is another circumstance which checks the desire of the farmer to obtain a comfortable dwelling. The general practice here is, that the proprietor should *lay out* the money necessary for erecting the buildings, or for making repairs; and that the tenant himself should *carry* all the necessary materials. In performing these carriages much precious time is lost; and that, frequently at the most critical period of the season. The loss thus occasioned by the interruption of the operations of the farm is deeply felt, and perhaps extends even to the ensuing year. The real interest of the proprietor dictates that the tenant should not be called off at any time from the necessary cares of the farm.

The subject of the accommodation required by tenants, to enable them to live comfortably, and to carry on the operations of husbandry with ease and spirit, begins now to be better understood, and more attended to than in former times. A number of great proprietors have given their tenants houses and farm offices, with other accommodations, at an expence proportioned to their rents, which seems to be a just enough criterion. On the Duke of Montrose's estates in this county, there are many such comfortable, and even elegant farm houses and offices. Sir Charles Edmonstone of Duntreath is distinguished in this respect; and, on his Kilsyth estate, neat farm houses have been built on almost every farm; and, in almost every instance, they are covered with slate; *some* of these farm houses have two storeys;  
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and all of them are properly suited to the extent of the farms. The house and farm offices of Captain Robert Davidson of Kilsyth farm furnish a model of agricultural accommodation, as his farm does of the first style of agricultural improvement.

Perhaps the most important of the modern accommodations of the farmer may be accounted the now general introduction of the farm yard; which is a square, formed by the different farm offices, paved within with small stones, and gently sloping from every side towards the centre. On the south exposure is the gate: the other three sides are furnished with sheds, or covered recesses, to shelter the cattle in severe weather. In these farm-yards, the cattle that are to be fattened for the butcher are fed through summer on fresh-cut clover; and, towards the end of the season, on turnips, potatoes, &c. In winter, the cattle that do not yield milk, are fed on straw and hay. Abundance of litter is always given them. The quantity of manure thus produced far exceeds that which can be otherwise obtained; besides that, the cattle, especially in winter, are better accommodated than by any other method. On Sir Charles Edmonstone's Kilsyth estate, there is a farm or straw-yard upon every farm of L.70 rent and upwards.

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#### SECT. III.—REPAIRS.

ON the subject of repairs, the reporter has met with no general regulation in this county. Perhaps  
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what has been advanced under the former section may be sufficient to convey some idea of the common practice in this respect.

SECT. IV.—PRICES OF BUILDING MATERIALS, AND ARTISAN'S LABOUR.

NEITHER can any very important information on the subject in this section be furnished. The materials of building, as far as respects stone, lime, brick, and tiles, are abundant, and may be abundantly obtained in Stirlingshire. But, with regard to wood, from the interruption of our intercourse with the Northern States, in consequence of the war, no calculation can be offered of its daily increasing price. Proprietors of forests of Scots fir have taken advantage of this circumstance, and some have sold their wood at the high price of half-a-crown per cubic foot. The price of labour too is increasing so rapidly, that no precise estimate can be offered.

The great expence that attends the building of farm offices arises from the extent of ground room, and the consequent extent of roof required. Of all kinds of roof a slated one claims the preference; but a slated roof is, of all others, the most expensive. Tiles are much used; but their durability is far inferior; and the expence is not much less.

There is another species of roofing which seems to merit particular notice. It was originally introduced into Scotland, indeed, in an adjacent county, and may  
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be found described in other publications ; but as it has lately been adopted in Stirlingshire upon a considerable scale, it may not be deemed improper to describe it shortly on this occasion.

The basis of this new species of roof is common *sheathing paper*, so called from its being employed in *sheathing* ships. It is first dipped in tar, and heated to the boiling point, that it may penetrate the paper more readily. After being exposed to dry for two days, the tar is found to be completely imbibed. The sheets are, a second time, dipped in tar at a lower temperature, and then nailed on the roof in the same manner as slates, over-lapping one another, so as to be triple at the joinings, and double in every other part. Above the whole is laid a coat of tar boiled to the consistency of pitch, on which smithy ashes are passed through a sieve, to diminish the combustibility, and to prevent the liquefaction of the tar.

The roof on which these sheets are laid is much flattened, no greater elevation being required than what is barely necessary to carry off water. The common proportion of the elevation is one foot in twelve. From the lightness of the paper covering, the couples are very slender ; no more than 3 inches in breadth, and  $1\frac{1}{2}$  in thickness : they are dressed with a plane at the edges, that there may be no intervals at the joinings\*.

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\* The above account of paper-roofs is abridged from the intelligent paper on that subject, by the Rev. Mr Graham of Fintry, inserted in the Farmers Magazine, No. 33.

From this account it is evident that a paper roof must be much cheaper than a slated one ; it has been estimated at half the expence ; but it has been suggested to the reporter that the expence, even of a paper roof, is *now* much increased by the high duty which has been lately laid on paper of all kinds.

This kind of roof was introduced into Stirlingshire in 1807 In the parish of Campsie, a large pile of buildings, in which an allum manufacture is carried on, together with a village containing 50 families, is roofed entirely in this manner. Mr Speirs of Culcruich, an enterprising agriculturist of this county, has lately set the first example of covering a house purely rural with paper.

With regard to the durability of this species of roof, it may suffice to observe, that it was first introduced into Scotland for covering a public store-house in Greenock, twenty years ago : during that period, it has received no repairs ; and, at the present day, continues in perfect preservation.

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#### SECT. V.—COTTAGES.

On the subject of cottages for manufacturers and labourers, the reporter does not pretend to such a knowledge of architecture, as to be able to suggest any thing that is not detailed in many other agricultural reports. In the eastern parts of Stirlingshire, the cottages, especially in the vicinity of Falkirk, appear to be very comfortable:

fortable : they are almost all of one floor, which is generally earthen. It were to be wished, for the sake of health and cleanliness, that they were floored with flat bricks, which, in that district, could be easily procured. They are covered sometimes with straw ; but more generally with tiles. The paper roofs which have been described would seem to be a great improvement, with respect to cottages, both in point of warmth and expence. In cottages of one floor, the utmost attention should be paid to cleanliness, to which frequent white washing would greatly contribute. It is of great importance to the health of manufacturers, that a small garden should be attached to their cottages. This, in Stirlingshire, is generally the case : many also possess a cow's grass, and a small piece of ground. It is obvious that the quantity of ground occupied by a manufacturer or labourer should not be so large as to divert his attention and time from his proper employment.

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#### SECT. VI.—BRIDGES.

On this subject, it may suffice to remark that no county in Scotland is better accommodated than Stirlingshire, in the convenience of bridges, on its numerous rivers and streams. On the Forth, from Stirling towards its source, there are four bridges within the limits of this county, besides two in the county of Perth, the smallest of them of two arches. The Endric, the Blane, the Kelvin, and Carron, are similarly accommodated.

## CHAP. IV.

## OCCUPATION.

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**T**HIS county presenting, as has been remarked, almost every variety of soil and climate that occurs in Scotland, is accordingly as variously occupied. The mountainous districts, which include the greatest part of the parishes of Buchanan and Drymen, together with the range of hills which runs through the parishes of Killearn, Strathblane, Campsie, Kilsyth, Fintry, St Ninian's, and Denny, are principally occupied in the pasture of sheep; throughout the latter range of hills, however, on account of the richness of the pasture, the upper part of the hills is mostly fed by sheep, while the lower part is generally occupied in feeding black cattle, and in fattening them for the butcher.

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The lower districts of this county are almost exclusively occupied in agriculture; and especially the carses of Airth, St Ninians, Bothkennar, Falkirk, and Colmont, are kept under a constant rotation of crops of every kind of grain that is cultivated in Scotland.

The pernicious system of distinguishing the lands into *infield* and *outfield*, the former receiving all the manure of the farm, whilst the latter was cropped from time to time, without any other amelioration than it might receive from resting, or from the urine of cattle pastured on it, is now very nearly abolished in Stirlingshire; though the marks of ridges, extending nearly to one fourth of the height of the mountains of Campsie, Kilsyth, and Gargunnoch, shew how far this practice prevailed in former times.

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#### SECT. I.—SIZE OF FARMS.

THE proper arrangement of farms, with regard to size, is one of the most delicate subjects that occur in the management of an extensive estate; and there are few subjects that have divided the opinions of political economists more. Some, considering that the strength of any country consists in its population, as it no doubt does, have argued that land should be portioned out in such divisions as will support the greatest possible number of inhabitants; and that, consequently, to enlarge the size of farms, by throwing several together, to be



occupied by one person, with his family, is a great political evil.

The experience of what has taken place, and is now actually taking place in the county of Stirling, tends to throw light on this subject, and to invalidate the above-mentioned reasoning. The period is yet very recent, when, in the western, or Highland part of this county, the population was much higher than it now is. In 1756, the population of Drymen was 2,789; in 1792, it was only 1,607. "One family now occupies what was formerly in the hands of seven or eight \*." The same thing has taken place with regard to many other country parishes of this district. But is it thence to be inferred, that the general population of Scotland, or even of this county, has suffered a proportional diminution? The Statistical Account of Scotland, and the account since taken by order of government, undeniably prove that the population of the country has increased, and is increasing.

The solution of all this is easy. In consequence of the general introduction of manufactures of various kinds, our cities and villages have increased in size and population in a ratio which it would be difficult to calculate. Many new trading and manufacturing villages have also started up. This county presents many examples, as Grangemouth, and the villages connected with the Carron-works; Balfron, Fintry, New Campsie, &c. To these villages, the ejected cottagers and smaller tenants have retired; and whilst they have left to the new occupant of their former possessions a more  
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ample field for the employment of his agricultural stock, and skill and industry; it is certain that, however they might at first regret their removal from their native cottages, their present condition is much more comfortable than their former. They are better lodged; their earnings are more regular; they are better fed, and better clothed; and they have better opportunities of educating their children, and of bringing them up to an useful profession.

It is true, that there ought to be limits to the accumulation of farms in the hands of a single individual; but it is presumed that the thing itself will prescribe its own proper limits. Few persons possessed of wealth sufficient to occupy a large tract of country in agricultural enterprise, will chuse to employ their fortunes in that way. They will either employ their money in purchasing estates for themselves, or in the more promising and less laborious pursuits of commerce. It appears unnecessary, then, to prescribe limits to the quantity of land which individuals should occupy; no prudent man will take more in lease than his stock and personal attention are adequate to; and both of these have their limits.

In the occupation of a grazing farm, there is little personal labour, and few servants are required. Accordingly, in the western district of the county, on the estates of the Duke of Montrose, and of General Graham Stirling of *Duchray*, the rents vary from L. 100 to 1,700 a-year; as to the extent of these farms, it must be estimated by miles, and not by acres.

In the lower districts of Stirlingshire, the arable farms vary in size, from 30 to 400 acres. On Sir Charles Edmonstone of *Untreath's* estate, the farms are enlarg-

in a very judicious style: similar arrangements have been made on the estate of Callander: and under this management, the country has assumed a very different aspect from what it formerly bore. In the parish of Falkirk, in the lower district, there is a farm of more than 300 acres: in the higher, or muirland district, there are farms of 600 acres.

It is to be regretted that the system of enlarging the farms to an adequate size, has not yet been generally extended to the most valuable district of this county, the Carse on the Forth. Here the farms are, for the most part, so small as to afford no scope for enterprize or improvement. Accordingly, the state of agriculture is here found, except in a few eminent instances, to be very inferior. It appears indeed singular, that in one of the richest districts of Scotland, and which has been, for so long a period, under cultivation, the first principles of agricultural economy should be so little understood, that the general size of farms is from 30 to 50 acres. Here, the loss to the occupant is great; as it is understood that, in the Carse, two horses are sufficient to labour at least 35 acres; and four horses, consequently, are sufficient for 70 acres. Mr Walker of Falkirk, whose example in agriculture, it is hoped, will soon be extensively imitated in this district, is the only person with whom the Reporter has met, who farms upon a large scale: he occupies near 300 acres in the Carse of Bothkennar. That gentleman, in one of his communications, justly remarks, "That the smaller the farms are, the worse they are farmed."

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Nor is this to be wondered at. On a small farm, the horses and servants necessarily consume too great a proportion of the produce, to leave an adequate profit to the farmer: and, where there is no prospect of adequate profits, there is no spur to enterprise. It may be safely affirmed, that, in the Cares, no farm should be under 80 or even 100 acres,

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SECT. II.—FARMERS.

THIS useful and respectable order of men has only begun lately to emerge, in this county, from a state of poverty and insignificance. About thirty or forty years ago, it was a rare occurrence that any man should rise to independence by the mere produce of the ground. The processes by which the soil may be made to yield the greatest returns of which it is capable, as well as those by which the operations of agriculture may be facilitated and abridged, were equally unknown. If the farmer was enabled to drag out existence, and to bring up his family as his fathers had done, upon his native spot, he considered himself as having attained the utmost felicity of which his condition could admit.

Graziers, and speculators in cattle, were the first class of farmers in this district, who were able to accumulate some

some wealth. In consequence of the increase of trade, and the enlargement of towns and villages, animal food came into more general use. The speculators in cattle, either by breeding themselves, or by purchasing cheap in the more remote parts of Argyleshire and Invernesshire, where few purchasers then resorted, were ready to meet this demand; and their profits were considerable. This occupation, too, requiring little personal toil, was more agreeable to them than the more laborious and unremitting cares of agriculture.

At length, however, the cultivators of the soil have begun, and that only lately, to assume the station which belongs to them in society: and enlightened proprietors have seen the wisdom of encouraging persons of some property, and of liberal views, to settle upon their estates. The agricultural improvements which have been recently introduced, with regard to the application of manures, the rotation of crops, and the instruments of husbandry, have had the happy effect of giving dignity to the profession of a farmer, and of rendering it not unworthy of being exercised by a gentleman.

There is, indeed, something in the occupation of a farmer, which is naturally attractive to the human mind; and which happily overbalances the many disappointments and chagrins and toils which necessarily attend it. To mark the progress of vegetable nature, and to direct and assist it, has inexpressible charms to an intelligent mind. The consciousness of being almost the actual proprietor of the fields which he cultivates, during the period of his lease, animates the farmer with  
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the idea of temporary independence: and, even under severe losses; the prospect of better seasons, and of more abundant crops, soothes his mind with hope.

It must be acknowledged, that, in order to support the farmer under his fatigues, under inclement seasons; and scanty crops, some such process of thinking as this is requisite. Numberless other professions offer more domestic comfort, greater bodily ease, and more abundant gains. But still, the profession of agriculture has charms which will attract candidates for every lease as it falls; and even induce him who has held it with little profit to renew his engagement.

It is to be hoped that the period will soon arrive when this useful and honourable department in society will be filled by persons of competent wealth, and of enlightened ideas. Then will that race of ténantry which pursue their occupation with little advantage to themselves, and to the great detriment of their country, pass away; and betake themselves to other occupations, better suited to their abilities, and, at the same time, more profitable to the community.

To accelerate this progress in the amelioration of the condition and character of the farmer, ought to be a primary object with every enlightened proprietor: for, whilst he adds to the comfort and dignity of the farmer, he enhances the value of the acres which he lets to him.—How have the rents of lands, and the revenues of landed gentlemen, increased so rapidly within these few years? Has it been by the exertions of the miserable and illiterate occupants of small possessions,—oppressed and despised by their Lairds, and subjected

to the most harassing and humiliating services? No surely: The striking increase that has taken place in the value of land has been brought about by the enterprize of farmers possessed of intelligence to comprehend the late discoveries and improvements in agriculture; and of sufficient stock to enable them to apply these successfully in practice.

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### SECTION III.—RENT.

RENT is the yearly return which the occupant makes to the proprietor for the use of his land. In Stirlingshire, as over almost the whole of Scotland, it is paid chiefly in money. Some great proprietors receive a small proportion of their rents in oatmeal; but only in such a quantity as is necessary to accommodate the numerous workmen who are employed about their domestic improvements. Formerly, it was the almost universal practice to stipulate for a certain number of fowls, called *kain*, or *kain-hens*, as a part of the rent: and it was equally universal to stipulate for a certain number of carriages, or of days work, at certain seasons of the year, to be performed by the tenant.

Though these stipulations are now, in a great measure, abolished, yet they are in many instances continued in this county. Their policy, however, appears  
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more than doubtful. They are evidently a relic of the oppression of feudal times. To oblige a tenant, at any season of the year, to withdraw his attention from the operations of his farm, must prove injurious to him; and in his loss the proprietor must also suffer. The payment of kain fowls is particularly harassing. That the occupant of a grain farm, whose cultivated fields often approach within a few yards of his door, should be obliged to rear a certain number of poultry, must certainly be very ruinous to him. They cost the farmer three times the price at which he could purchase them in the market; and accordingly, it is not unusual for him to purchase, rather than to rear, the fowls which he pays in rent. It is an unfortunate circumstance that tenants do not attend to the import of these stipulations before the terms of their leases are finally settled. In their eagerness to obtain their farms, they consider only the money rent;—and accede easily and thoughtlessly to inferior demands, which they find, in the end, to be sufficiently distressing.

Many great proprietors in this county have, to their honour, abolished these remains of barbarism. Lord Dundas, one of the greatest landholders in the Carse, receives only money rent, having abolished all carriages and payment of kain. On the estate of Sir Charles Edmonstone of Duntreath, "All thirlages, mill services, kain, carriages, and every species of servitude, are totally abolished, as destructive to husbandry, derogatory to the tenant, and repugnant to the feelings of the generous and enlightened proprietor."

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It has become a practice of late in Stirlingshire, and its influence seems to be extending itself, to stipulate for rents payable altogether in victual, according to the fiars of the county. The equity, and even the policy of this practice, seems to be very doubtful. The proprietor, indeed, has a chance of receiving an increased rent from the increased price of victual. But what is the unfortunate condition of the tenant, when, in an unfavourable season, that has yielded him only half a crop, he is obliged to pay the same quantity of grain as if he had a full one? Had his rent been payable in money, he would have had a compensation in the advanced price of grain, which is the consequence of a year of scarcity; but the tenant who pays in grain in such a year, must be ruined; and, in his ruin, the proprietor must also suffer.

With regard to the amount of rents, it has increased, within these few years, in a threefold, and often in a fourfold ratio. In the grazing districts of this county, the rent of land is determined by the number of cattle that it will maintain.—In Buchanan and Drymen, the rent of a sheep's pasture is estimated at 4s.; but there, a sheep's grass often requires three acres; and sometimes twice that extent. In the fertile hills of Alva, 4s. 6d. is reckoned the rent of a sheep's grass; but there, an acre will maintain a sheep, and sometimes more. In the mountain pastures of Gargunnock, and probably all along the Lennox hills, an acre will maintain two ewes, with their lambs. In the Campsie fells, the summer's grass of a cow lets from L. 3. to L. 4.

The rent of arable land varies extremely, according to its situation and quality. In the light dry fields of  
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the upper part of the county, it lets from 20s. to 40s. per acre. In the parish of Denny, the best land lets for 50s. and inferior land for 20s. per acre.

To furnish some idea of the rapid rise of rents in this county, the following sketch is given, *on the best authority*, of the change of circumstances which has lately taken place on Sir Charles Edmonstone's Kilsyth estate. "Previous to the expiration of the leases of 60 years " which had been given under the forfeiture, the rent " of the arable land, even in the lower grounds, which " are a rich clay loam, was trifling: the pernicious dis- " tinction of *infield* and *oufield* universally prevailed: " there were few or no inclosures: the tenants were " miserably accommodated with houses: the rental of " the whole estate did not exceed L. 1000 a-year; no " tenant paid, of mere rent, more than L. 35: his sub- " stance was consumed, and he himself was impoverish- " ed, by grassums. In 1804, the proprietor began a " system of improvements, the beneficial consequences " of which are already felt. The estate is inclosed and " subdivided. The distinction between *infield* and *out- " field* abolished; and the tenants have begun to adopt " the most improved modes of agriculture that are " known in this kingdom. Many of them pay from " L. 200 to L. 800 a-year of rent. Some cottagers are " still continued, with the view of preventing the depo- " pulation of the country. The rental of this estate now " exceeds L. 6700 a-year."—The fine loam lands here let at L. 8 per acre. The rents, in general, in this district, are from 25s. to L. 3.

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\* Communication by James Davidson, Esq. Colzeum.

The farms of Boquhan, in the parish of Gargunnock, have been lately let for sheep pasture at L. 3. 10s. per acre.

In the Carse of Stirlingshire, the rent of land has lately risen in a high proportion. In Gargunnock, carse land is now let at 5 guineas per acre, *besides other burdens*. In St Ninian's, Larbert, Airth, Bothkennar, Falkirk, and Polmont, land of this kind lets from 5 to 6 guineas per acre.

It is universally observed that, as the rents rise, the tenants become industrious and thriving: where they are low, the tenants are slovenly and poor.

#### SECT. IV.—TITHES.

To those who are acquainted with the Ecclesiastical State of Scotland, it is unnecessary to remark that *tithes*, in their original acceptation of a *tenth* of the produce of the ground, set apart for the maintenance of the clergy, are totally unknown.—To those who are strangers to our ecclesiastical establishment, it may be proper to suggest, in so many words,—that, at the Reformation of religion in Scotland, the property of the church, consisting of the *tithe*, or *tiend*, as it is here called, passed, by a gift of the King, into the hands of laymen, with the exception of the *tithes* appropriated to the support of

of universities, schools, and hospitals; together with the small pittance that was assigned to the reformed clergy. These laymen were called *titulars of the tiends*.—The hardship of paying the tiends to these titulars, according to the form in which they were anciently paid to the church, was soon severely felt and complained of by the proprietors of land. The whole matter was referred by both parties to the sole arbitration of King Charles I. who, in 1629, decreed, “That the heritors “could demand a valuation of their tiends; and that “they might further oblige the titular to sell their “tiends to them at the stated price of nine years purchase: instead of the tithes which were formerly levied in kind, a *fifth* of the land-rent was declared to “be the tiend.”

Thus it is in the power of every proprietor of land to have his tiends valued; and, in most instances, to purchase them from the titular at nine years value.

The small augmentations which the stipends of the clergy receive from time to time, from the *Court of Tiends* (to which the administration of the laws on this subject is committed) arise from the unexhausted tiends which may be in the hands of the titular; or, when these are exhausted, from those which have been bought up by the proprietor.

It may be permitted, on this occasion, briefly to state, that, in no country of Europe, is the Ecclesiastical Establishment supported at so small an expence as in Scotland. An authentic account will be given, in separate tables, of the value of the livings of the clergymen of Stirlingshire.

It may be allowed to add, that the proprietors of land have no cause to complain of the additions which have been made to the livings of the clergy from the unappropriated tiends. By the law of the land, these tiends are burdened with the support of the established ministers; and it was undoubtedly intended by the legislature that this support should keep pace with the advancing circumstances of society, so as to maintain the clergy in the rank which they originally occupied, and which they must occupy, in order to be respectable and useful. With this burden, every proprietor of land has purchased, or succeeded to his estate; and, under this condition, of supporting the established clergy, every titular has obtained the gift of his tiends.

The truth seems to be (and it is hoped that the remark will be forgiven) that the danger which threatens the Ecclesiastical Establishment of this country has its source in its poverty. At the distance of twenty or thirty years ago, it is well known that young men of liberal minds, and of decent circumstances, were induced, by the cheapness of living and of education, to undergo the long and arduous course of study which is requisite in a candidate for our church. But, within that period, the circumstances of this country have undergone a very material change, in consequence of the increase of trade and manufactures, and of the depreciation of money. Every rank in society has profited by this change, the stipendiary alone excepted. How can it be expected that even the pious desire of guiding men in the paths of virtue and religion, will be effectual, upon an extensive scale, to induce young men of genius  
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and learning to devote themselves to a painful and expensive course of study, for the space of eight or ten years, double the period of the studies requisite for a lawyer or a physician; whilst the circumstances of the country open up a thousand more promising paths to independence? Recent events have taught us the wisdom of maintaining our ancient establishments both in church and state. Unless the provision assigned to the clergy in Scotland be made to keep pace, in some degree, with the rapidly advancing circumstances of society, the period seems not to be far distant, when the enlightened characters which now adorn our church, must give way to an illiterate and grovelling race, who are neither qualified to understand the venerable records of our religion, or to represent their important truths, in an engaging light, to the people. \*

With the provision made for the clergy of Scotland, that for parochial schoolmasters should go hand in hand. It is to this institution, and to the consequent cheapness of education, that our country has so long owed the proud distinction of generally diffused knowledge, which marks even the lowest ranks; and which is to be found in no other country of Europe. This provision has been lately increased by a legislative act; but it seems to be still too low to encourage any young man of talents and of spirit to engage in so laborious a profession. A Table of the income of schoolmasters in

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\* Since this Report went to press, an act of the Legislature has passed, assigning the annual sum of L. 10,000, to increase the small livings of the Scots clergy to L. 150 each;—a measure worthy of a liberal and enlightened Government.

this county will be added, so far as it has been ascertained.

SECT. V.—POOR RATES, &c.

In Scotland, by an act of Privy Council, 1692, “The heritors of the parish are directed to meet with the minister and kirk-session; to make up a list of the parish poor; and to impose an *assessment* for their support, the one half on the heritors, according to their valuation, and the other upon the tenants and householders according to their ability.”

In some populous towns and parishes of this county, where trade and manufactures have been carried to a considerable extent, assessments have taken place in the terms of this act. In country parishes, however, the poor are chiefly maintained by the interest of money which has been accumulated by charitable donations; by the collections made in church on Sundays; by the price paid for the mortcloth, or pall, at funerals; by fines for acts of immorality; and by the money paid for the proclamation of banns.—A list will be given in a separate table of the poor of this county, with the funds for their maintenance, whether raised by assessment or otherwise.

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## SECT. VI.—LEASES.

THE duration and conditions of leases vary very considerably in this county. In the Highland district, which is occupied almost entirely in sheep walks, and where few improvements are practicable, the leases are for nine years. In farms that are held in tillage, the leases are generally of 18, 19, or 21 years,—periods which furnish scope for the tenant to launch out a portion of his capital in improvements, with the reasonable prospect of reaping the fruits of his industry and expenses.

In former times, when society was in a great measure stationary, and little of the spirit of agricultural improvement among tenants, the proprietor often found great difficulty in letting his lands: and he often found it necessary to entice occupiers by granting leases during their life-times, and sometimes for two lives. Leases for three 19 years were not uncommon. The valuable estate of Killearn in this county is still encumbered with many leases of this kind, some of which will not expire for at least 20 years. Such leases are injurious to the occupant, as well as to the proprietor;—the former,



having no spur to enterprize, becomes indolent and poor: the latter is deprived of the benefit to which he is intitled from the gradually improving circumstances of a nation rising to wealth by manufactures and trade.

The proprietors of the present day are sufficiently aware of their own interests in this respect, and duly attentive to them. In some instances, in this country, they have been tempted, by hopes of a frequently renewed rise of rent, to shorten the period of their leases to a degree that must prove highly prejudicial to the tenant. Even in the Carse of Stirlingshire, the productiveness of which depends entirely upon an enlightened and spirited mode of cultivation, though the general length of leases is, as it ought to be, 19 years, some lands are let for only 10; and there are even some occupants who are only tenants at will. When it is considered, that no man of sense will launch out his capital upon lands from which he can have no prospect of drawing adequate returns; and that the needy adventurer, who will risk such an undertaking, must necessarily rob the soil of as much of its virtues as he can, in order to indemnify himself for the precariousness of the tenure by which he holds it; it is to be hoped that the proprietors will, at length, perceive that what is the interest of the tenant is theirs also.

As to the restrictions under which tenants are generally laid, with regard to the cropping of their lands, these also vary considerably in this county. In some instances, there are no restrictions whatever: the tenant is allowed to crop as he pleases, from the beginning

ning to the conclusion of his lease. Such a licence, however, is highly injudicious, and hurtful to all parties. In estates managed in this way, the whole soil is, at the end of the lease, a mere *caput mortuum*; and, at the beginning of a new lease, requiring to be recruited by manure and rest, it cannot bring nearly its just rent. In some estates, the arable land is divided into *three* equal portions; one of these to be held in tillage for *three* years, and then let out in grass; and so on, with the other two *thirds*. Were it possible for the tenant, on the last year that he occupies his *third*, to lay on as much manure as will be a proper dose for it, and to let it out under grass seeds, this scheme might be admissible. But, in almost no instance where the farm is of considerable extent, is it possible to procure so much manure as will be sufficient for a *third* part of it; and, where any part is let out without sufficient manure, even a rest of *six* years will not restore it from its exhausted condition. Where the leases are long, as of 19 or 21 years, it should seem that it were sufficient to restrict the tenant to the cultivation of *one third* of his farm, only during the *last four years* of his lease, a restriction which appears to be indispensable.

The principal argument that has been advanced against the unrestricted occupation of the farm during the earlier period of the lease is, that if the tenant finds himself in bad circumstances, he may, in the prospect of bankruptcy, exhaust the soil and leave it in that condition. This, no doubt, is a consideration to be attended to; but it may be observed, that the proprietor, having always the *delectus personae* at letting his

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farm,

farm, should then attend to the circumstances of his tenant; a measure, it must be confessed, not always easily accomplished.

In the Carse of Stirlingshire, tenants in general are not bound down to any rotation of crops, till the last *three* years of their leases, when it is stipulated "that they shall not take *two* white crops successively."

It is a general clause in leases, that the tenant shall not sell his victual *upon the foot*, as it is called, or with the straw; a very necessary regulation, by which the whole straw is preserved upon the farm, and restored to the land in the form of manure.

As over the most of Scotland, the tenant here enters to the occupation of the arable land at Martinmas; and to the grass lands and houses at the ensuing Whitsunday.

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#### SECTION VII.—EXPENCES AND PROFIT.

THERE is perhaps no department of national industry in which it appears more impracticable to offer even an approximated estimate of expences and profit, than that of the agriculturist. In the occupation of *arable land*,—these depend in a great measure upon the favourableness or unfavourableness of the season; upon the casual abundance or scantiness of the crop; upon the  
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the state of servants wages, which is affected by that of adjacent manufactures, and various other circumstances : To these circumstances may be added, the increased expence of living, taxes, the price of agricultural implements, and cattle employed in labouring.

In pasturing districts, which abound in this county, the expences and profits depend so much upon the fluctuating state of cattle-markets, that it is impossible to offer an estimate of any general application. For the *three* years preceding the present (1809,) the prices of cattle were low ; and there was some reason to apprehend that the graziers could not have stood to their present rents had things continued in that state ; but from the commencement of the cattle markets, in last May, prices have been increasing every month. Many dealers in cattle in this district are reckoned to have made 20 or 25 per cent, on their sales. The fact seems to be, that the number of cattle at present in the country is considerably inadequate to the demand. The consequence will be the increase of the breeding system ; and then, as has been often remarked by observing persons, matters will, after a period of three or four years, return to a level in this respect ; and the price of cattle will fall.

It may be added, that the difficulty of forming any calculation with regard to the profits and expences of farmers is increased by the circumstance that almost none of them keep regular accounts of their affairs, or can give any account of them. Of the few enlightened agriculturalists in Stirlingshire, who observe a methodical precision in their transactions, it might be considered as indelicate to request an account.

CHAP.

## CHAP. V.

## IMPLEMENTS OF HUSBANDRY.

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BEFORE entering on the consideration of the various implements and operations, which will occupy this and some of the ensuing chapters, it may be proper to premise, that it is not conceived that such a detailed view of these should be given as might be expected in a regular treatise on agriculture. In the agricultural report of a particular county, it is presumed that the reader is acquainted with the general principles of rural economy; and all that seems necessary is to notice their peculiar application in the county under consideration.

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Having made this remark, it may be observed, that the implements of husbandry used in Stirlingshire do not differ so much from those which are employed through the whole of the low country of Scotland, as to require a particular description. In the eastern and southern parts of the county, especially, all the improvements have been introduced in this respect that are known throughout the kingdom. In the highland district these are also gradually making their way.

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## SECT. 1.—PLOUGHS.

IN the Highland district, the ancient barbarous manner of ploughing with four horses a-breast, and, besides the ploughman, a driver called a gadesman, walking backwards before the horses, holding a horizontal beam, to which they are all fastened, and beating them in front in order to make them advance, may be still sometimes met with, to gratify the curiosity of the inquirer into ancient modes of agricultural practice. But even in the highlands, and universally in the lower districts of this county, the two-horse plough, managed by the ploughman alone, is now introduced.

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The old Scots plough is still in considerable repute. It answers well for tearing up a coarse and stoney soil : it sets up the furrow with a bold shoulder, so as to furnish abundance of mould for the operations of the harrow. Its disadvantage is, that it generally requires more than the power of two horses.

Small's plough is at present almost in universal use in this county. Its excellencies are its lightness, and the form of the mould board, which is of cast iron, and which, rising from the share by an easy curvature, diminishes the friction and requires a smaller power of draught. This plough is universally used on the farms under the improved regime upon the Kilsyth estate of Sir Charles Edmonstone. In the Carse of Stirlingshire, where agriculture is still in a great many instances in a very unimproved state, the Scots plough has not yet altogether given way to Small's. It is there alleged by some, that Small's plough, which by its construction is calculated to go deep, and which, if it does not go deep, lays the furrow over imperfectly, is apt to bring up the till which lies under the clay, and thus to produce a mischievous effect. When, however, the enlightened ideas and practice of some intelligent farmers in that district come to be better understood, it will be known that deep ploughing is the best ; and that there is no risk in turning up the subjacent soil, which by intermixture with the superior strata, and alternate exposure to the light and frost, will soon become equally good with the rest.

Small's plough is also called the chain plough, because at its first introduction it was drawn by a chain, passing under the beam, fastened immediately below the  
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the coulter, and connected by the muzzle at the fore-end. This chain is still used in some places; but is more generally disused, as affording little additional strength to the beam.

On this subject, it were to be wished that ploughwrights were better versed than they generally are in the common principles of mechanics; and that they had a better notion of the most advantageous method of turning over the furrow: that undoubtedly is the most perfect, by which the furrow is laid over at an angle of 45 degrees, exposing the greatest possible surface to the air and to the harrow.

Levelling and drill ploughs are commonly used.

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SECT. 11.—HARROWS.

IN the harrows used in Stirlingshire, there is nothing very peculiar. They are sometimes of three beams or *bulls*, as they are here called, and sometimes of four. These are joined together with cross bars: in every beam there are five, and sometimes six teeth, here called *tyes*. The teeth are of iron, and have a bevil forward at an angle of about 70 degrees, in order the more effectually to tear up the stiff ground and to root out the weeds. Two harrows, drawn by two horses, are joined together in such a manner as that the

course



course of the teeth may coincide as little as possible; and so as to pass over the ground in the most equable way.

A heavy harrow, called a *breake*, is sometimes, and ought to be more generally used, for tearing out couch grass, and other obstinate weeds, in summer fallow, or for preparing the ground for barley. It is generally of two pieces and of a triangular form, the teeth very long and stout. The hinder part is furnished with two handles to raise or depress the teeth, as may be necessary. Great attention is required in the person who directs the handles to observe when the teeth of the *breake* are filled with roots; and the horses must be stopped till they are removed. The same operation must be repeated at every turning of the harrow at the end of the ridges. The roots are afterwards collected and burned; but, it may be observed, that a more advantageous practice would be to throw them into a heap in some corner of the ground; there the most noxious weeds will ferment, and, in the course of about two years, be converted into valuable manure. The process might be accelerated by the addition of a little lime in a caustic state. This process has actually fallen under the reporter's notice in Dunbartonshire.

## SECT. III.—ROLLERS.

THE roller is an indispensable instrument in husbandry; and the heavier the roller, the more effectual it is. In no district is the use of the roller more necessary than in the Carses, or clay lands, of Stirlingshire; where, in dry springs, notwithstanding all the efforts of the plough and harrow, in pulverizing the soil, the hard consolidated masses of clay, which deform the soil, can be reduced only by the roller. Before the introduction of the roller, it was common in the spring for all the men and women on the farm to be employed for several days in breaking the clods on clay soils, with wooden mallets, or *mells*, as they are called.

But perhaps the most important use of the roller, is the consolidation of the loose soil, which had either been naturally light, or which had been rendered friable and porous by the frosts, which, in this climate, often succeed the seed time. In such soils the seed, which had begun to send forth its fibres in quest of nourishment, finds nothing but open pores destitute of sap and warmth. By the operation of the roller, these pores are filled up; the roots of the vegetables are fixed in the soil; and the moisture necessary to vegetation is prevented from evaporating.

There is another application of the roller which merits attention. The seed time of 1808 was uncommonly

ly early. Oats were sown in a considerable quantity in this district in February, and the whole oat seed was over early in March. Drought, accompanied by very severe frosts, succeeded for several weeks. In light dry field soils, especially in the western parts of Stirlingshire, the ground swelled and became open and porous. Whether from something peculiar to the season, or from the porousness of the soil, the oat-fields became infested with myriads of slug worms, which devoured the tender roots of the grain; rendered whole acres unproductive; and threatened the ruin of the crop. It was remarked that this devastation was most fatal in grounds that were in the best condition, as in old leys which had been let out in grass. A field of about seven acres, occupied by the reporter in the immediate vicinity of the western district of Stirlingshire, was threatened with the total ruin of the crop; so that, at one time, thoughts were entertained of ploughing it down, and sowing it a second time. By the use of the roller, this disagreeable operation was rendered unnecessary. The field was rolled twice; first, to obviate the effects of the frost in heaving up the soil; and then, after the young corn had got up, to destroy the slug-worm. This second rolling was given after sunset, and before sunrise; as it was understood that it is during the night that these insects come forth from their lurking places and commit their depredations. In this operation, it is to be presumed that many of them were crushed to death; and what is perhaps of more importance, the earth was consolidated, and the pores, by which they had issued forth, were compressed and shut

shut up. It is sufficient to say, that the operation was completely effectual, and that the ensuing crop was abundant.

Rollers of every kind are used in Stirlingshire. Some are of wood, but not the most approved ; many are of stone ; hollow rollers of cast iron are frequent. Rollers divided into two parts, and fluted rollers are not uncommon.

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#### SECT. IV.—DRILLS.

DRILLING machines are generally used in sowing turnips and beans ; and, by their means, the operation is no doubt performed with greater regularity and expedition, and the ground afterwards cleared of weeds with greater facility. Drill husbandry, however, has not been yet introduced into this county upon an extensive scale. As far as the reporter has found, it is only practised with regard to potatoes, turnips, and beans ; and with respect to beans, he meets with a considerable difference of practice and opinion amongst the most intelligent agriculturalists. In the Carse of Gargunnock, the drilling of beans is not found to answer, and is disused. Such, it appears, is the tenacity of the soil, that in horse-hoeing, large masses of compacted clay are torn

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up,

up, and the crop materially injured. In the Carres to the east of Stirlingshire, and in the rich loams of Kilsyth, beans are generally drilled. The difference between the practice in the Carres of Gargunnoch, and in the eastern parts of the county, arises probably from this, that the latter having been longer under the operations of agriculture, the soil has been rendered more friable than that of the former, which has been more lately brought under a proper mode of cultivation.

As to a great number of the articles specified in the plan of the Board of Agriculture, under this chapter, it does not appear necessary to enter into a laboured detail. The most of these instruments are too familiar to require description. Many of them again are unknown in this district, as scarifiers, scufflers, draining-mills, &c.

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#### SECT. V.—THRASHING-MILLS.

SUFFICE it to say, that thrashing-mills, with their appendages of shakers, and winnowing-machines or fanners, are now very generally introduced into this county. Few or none who farm to any extent in the eastern and southern districts, want this first implement of husbandry. They are almost universally wrought

wrought by horses, water being for the most part scarce. The power of the mill is estimated by the number of horses that is necessary to work it; an indefinite estimate, it must be allowed, to persons unacquainted with the strength of the horses employed, but sufficiently intelligible in the district under consideration. We speak of a thrashing-mill of a three-horse power, a four-horse, and a six-horse power.

From the daily increasing price of wood, and of other materials of every kind, an ordinary thrashing-mill costs from L.60 to L.200. A thrashing-mill of a three horse power, in this county, cost, about four years ago, L.125. At the present day it would cost 25 per cent. more. Ten men are employed whilst it is in use, in the various operations belonging to it; it thrashes at the rate of ten bolls of wheat every hour, or 100 bolls in a day of ten hours.

Without enlarging on the utility of this machine, this may suffice to demonstrate the saving which it occasions. It is unnecessary to offer an estimate of the time, and the number of hands that would be required to thrash 100 bolls of wheat by the flail. It is reckoned that one third of the expence of labour is saved by the use of the thrashing-mill.

## SECT. VI.—CARTS.

THE one-horse cart is almost universally employed throughout this county. It is understood that one horse can draw about 20 tons. Were 40, or even 30 tons put on, not only the roads would be cut up by the greatness of the weight, but the burden horse would be soon destroyed. It is remarked at the same time by intelligent men; “that in the two-horse cart, the foremost fails soonest, probably from the inequality of his pull.”

The Falkirk carriers have been long celebrated for dexterity in their profession. Before the opening of the great canal, the whole mercantile intercourse between the ports upon the Forth and the city of Glasgow was carried on by carters chiefly of this district; and it is certain that they have long given the preference to the one-horse cart. By long experience they have ascertained that one horse, with a cart properly fitted to his size and strength, will carry two-thirds of the load that two horses drawing in a line, and of corresponding strength are capable of doing.

According to the most approved construction, the cart wheels are about four and a half feet diameter. The axle is sometimes of wood, but more generally of iron,

iron, which is surely preferable, as it occasions less friction.

In many parts of this county, especially in the western district, single-horse sledges are still used for carrying hay, or corn in the straw; they are very cheap; the husbandman generally constructs them for himself.

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SECT. VII.—KILNS AND MILLS.

This seems to be the most proper place for shortly noticing that great improvements have lately taken place in those necessary appendages of rural oeconomy, the kilns and mills of this county. Formerly kilns for drying victual were miserable hovels covered with thatch; every farmer had his own kiln; the grain was placed upon rafters covered with straw, and innumerable accidents happened by fire. It must be acknowledged that kilns of this kind are still frequently to be met with, especially in the western district; but in general they are substantially built, covered with slate, furnished with a bottom or flooring of cast iron, and, in many instances, connected with the mill, and under the same roof.

The mills are generally furnished with the proper apparatus for grinding every kind of grain; for rolling malt, and for making pot barley of every degree of



fineness. In the parishes of Kippen and Gargunnoch, there are several mills of the best construction, which have the easy advantage of copious mountain streams. The lands in this county being, for the most part, free from thirlage, the millers charge for their labour some, one part in 33, and some, one part in 41, of the grain that is grinded; and for preparing a boll of barley for the pot 2s. 6d.

CHAP.

## CHAP. VI.

## INCLOSING.

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By certain acts of the Scottish parliament \*, it is ordained, that contiguous proprietors shall be at an equal expense in inclosing their lands which border upon each other. These statutes continue to be acted upon; and thus the important improvement of inclosing, without which ground loses a great part of its value, has been much promoted in Scotland.

The only other instance that now occurs, in which inclosing is enforced by statute, is that of fields cut up by turnpike roads under an act of parliament. In this

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\* A. D. 1661, ch. 17. and 41.

case, the trustees of the roads are bound to indemnify the proprietor for the land occupied by the new line, and also to inclose his field with hedge and ditch.

It may be observed, however, that notwithstanding the statute of so early a date, little progress was made in inclosing till within these thirty or forty years. In the mountainous parts of Stirlingshire, we may still trace the remains of rude fences or dykes, which separated the lands under tillage from those which were held in pasture. These generally ran in a straight line along the mountain about one-fourth of the way from its base. They were probably sufficient to prevent the encroachments of black cattle; for in those days sheep, which require a loftier and more sufficient fence, were reared only in small numbers. The subdivision of fields, and the inclosing of them with walls or hedges, were in former times unknown.

Of the various sorts of fences now employed, the rudest and simplest in its construction is called the *Galloway dyke*, (probably from its having been first and most generally introduced in that country). It is formed of large ill-shaped stones strongly wedged together, for about two-thirds of its height: and then, of stones gradually decreasing in size, for 18 or 24 inches more. The interstices between the stones are wide, and the light being seen through them frightens the cattle, especially sheep, and deters them from attempting them. They are cheaply erected, and cheaply repaired. In the parishes of Fintry, Denny, St Ninians, and the muir lands in that neighbourhood, many miles of such fences occur.

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*Stone walls* of about four and a half feet high, with a coppice of sods of earth or turf, sometimes laid on in two rows, are also very frequent. They have the *advantage* of forming a fence of great strength and duration all at once. They have the *disadvantage* of interrupting the current of the winds with such sudden violence as to occasion gusts or eddies upon the surface of the ground, which rush on with increasing impetuosity over the fields, and disturb the stratum of air which lies next to the surface of the earth, and is most conducive to vegetation \*. In this respect hedges, with  
hedge

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\* Here it may be permitted to take notice of a well known principle in the natural history of our atmosphere; which the practical farmer will do well to attend to in his operations. It is this, "that it is highly advantageous to the growth of vegetables, that the stratum of air which lies in contact with the earth, should be as much as possible in a state of *rest*." Chemists teach us that the air which we breathe consists of various substances, which, in the modern nomenclature, are termed gases. Of these an opportunity will afterwards occur of shewing, that the *carbonic acid gas* holds the most important rank in promoting the process of vegetation. It is this gas which is evolved in burning limestone, or in reducing any calcareous substance by acids or by fire. It is produced in the process of fermentation; and its existing quantity in the atmosphere is, no doubt, momentarily increased as it is consumed, by these and other well known processes. The quantity of this gas existing in the atmosphere is stated by chemists to vary from 0.005 to 0.01.

Dr

I have been thinking about you a great deal lately. I hope you are well and happy. I am still working hard, but I always find time to think of my friends. Please write soon and let me hear from you.

Your affectionate friend,  
John Doe

in a ~~comprehensive~~ ~~the~~ ~~series~~. By this ~~it~~

are gradually naturalized to the soil and the climate. In constructing these fences on the Callander estate, not less than six millions of thorns have been planted; and the line of these measures about four hundred miles in length: the trees of various kinds, planted in the hedge-rows, amount to above 200,000, forming alone a forest.—It is unnecessary to remark the beauty which hedges and hedge-rows give to any country: in the dead levels of the Stirlingshire carses, they contribute particularly to please the eye, and no where do they grow more luxuriantly.

The only species of fences which remains to be noticed, is that of *sunk fences*, as they are called. A few years ago, these were a favourite kind of fence in gentlemen's pleasure grounds; and they occur frequently in this county. On the one side, the earth is scooped out to the depth of five feet, or more; it is made to slope gradually from the bank to the level of the ground; and the bank itself is faced with stones neatly built, and sometimes cast with lime. On the other side, the grounds are on a level with the top of the wall, which is not seen; and, from that point of view, the eye is presented with an uninterrupted plain. In this respect, it is beautiful; but it is not a sufficient fence against sheep, who can easily leap down from the side that is level with the ground, unless a hedge be added on the top. It thus becomes an expensive fence; and is not now so much practised as formerly.

With regard to the expense at which these fences are constructed, it is extremely difficult to speak with precision, on account of the incalculable difference  
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which must take place in different situations, from the ease or difficulty of procuring the materials, and various other circumstances. Hedge and ditch, with paling, cost, in the Carse of Gargunnock and Kippen, about L. 1. 5s. per rood of 36 lineal yards. Stone walls or dykes cost from L. 2. to L. 4. per rood. Stone walls, when well built, will last, with little repair, for forty years.

*Gates.*—With regard to gates, it is unnecessary to enlarge. In the more improved parts of the county, they are uniformly of one piece, moving upon hinges of iron, fixed in stone, or sometimes in wooden posts. They consist of four or five horizontal bars, supported by upright as well as diagonal bars. Those used at the Duke of Montrose's seat at Buchanan are elegant, and peculiarly convenient. They are so exactly balanced upon their hinges, that they are opened with the smallest effort, and they shut of themselves. One of these gates, with all its appendages, costs L. 10. or L. 12.

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#### SECT. III.—NEW FARMS.

UNDER this head, nothing occurs, unless the throwing of several small farms into one, which, as has been noticed already, is frequently practised in Stirlingshire,  
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is to be considered as establishing a new farm. In this view, almost all the farms on the estates of Callander and Kilsyth, may be denominated *new*: for, from almost a state of nature, they have been newly arranged and subdivided: new farm offices have been built, and new tenants introduced: a measure which, though at first it excited some clamour amongst the ignorant and interested, has ultimately proved highly beneficial, and added, in more than a threefold proportion, to the productiveness of a rich district of country, which was formerly almost lost to the public.

CHAP.



## CHAPTER VII.

## ARABLE LAND.

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SECT. I.—TILLAGE

MANY particulars relating to the subject of tillage have been necessarily anticipated in describing the instruments employed in cultivating the ground, as the plough, the harrow, and the roller.

To plough deep is of great importance; and no plough seems to be better calculated for this than Small's. To plough deep is the practice of the most enlightened farmers. In the corses, it is necessary in order to open up the soil; to afford room for the water to filtrate, and to run off into the drains; and to permit the roots of plants to run out in search of food. In every sort of land, it is necessary in order to add to the staple of the soil, and to bring up the moist earth that lies below and never saw the sun: by the action of solar light,  
and

and of frost, and by the absorption of the natural acids which float in the atmosphere, even this earth is soon rendered fertile.

The operation of ploughing is advantageously commenced, especially in old leys, in the beginning of winter, when the weather is open. The mould is pulverized, and the roots of noxious plants destroyed, by the succeeding frosts.

In the ancient practice of this county, little attention was paid to the direction or construction of the ridges; they were generally winding in a semicircular form, too many specimens of which may be still observed, even in the lower and richest districts of this county.\* They were besides raised high in the middle, so that the most fertile parts of the soil were accumulated there, whilst the sides of the ridge were left bare and thin.

A few enlightened farmers in the Carse have, of late, set an example, which it is to be hoped will be followed, of levelling and straighting their ridges. These consider the height of nine or ten inches in the middle as sufficient to carry off the water into the furrow; and the breadth given to the ridge is from 15 to 18 feet.

In this district, where the storms blow most frequently and most violently from the *south-west*, it may be proper,

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\* It is singular, that at a very remote period, as has been already noticed, the ridges, of which the vestiges still appear in the Gargunnock, the Campsie, and Kilsyth hills, were perfectly straight and equal.

when the situation of the field will permit, to give a similar direction to the ridges; for it is obvious, that, when the side of the ridge is exposed to the rains and winds, the finer particles of soil are washed down into the furrow, and probably carried off altogether. When the ground is steep, the same consideration of preventing the finer particles of soil from being lost, should direct the arrangement of the ridges in a slanting form. When the ridges are thus properly constructed, and the furrows properly turned over, the seed, in sowing, will naturally fall into the form of a drill.

The more general introduction of ploughing-matches in this county would have a beneficial effect in stimulating the ploughman to execute his work in the neatest and most effectual manner. These institutions, however, are yet unknown, in the carse to the east of Stirling, where their introduction appears the most necessary. The Gargunnoch farmer club, of which an account will afterwards be given, has, for many years, granted premiums annually to those within the western district, who excel in these competitions; and there, the skill and dexterity of the ploughman are rapidly increasing.

No crops are put into the ground without ploughing, as far as the Reporter can learn, except potatoe oats, which are sometimes sown in this manner, after potatoe or turnips.

Potatoes and turnips, and sometimes beans, are cultivated in drills; and, in freeing them from weeds, horse-hoeing and hand-hoeing are occasionally employed.

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In the operations of the farm, that of WEEDING holds an important place. Of the noxious weeds which infest the arable lands of this county, some are *perennial*, others are *annual*. It may be proper to take notice of some of the most hurtful in each of these classes.

#### I. PERENNIALS.

1. The *heracleum sphondylium*, or cow-parsnip, sometimes, and happily but rarely, occurs in arable lands. It strikes its roots downwards for 20 inches or more, and is extirpated with great difficulty.

2. Of the *tussilago farfara*, some mention has been already made. It is very difficult to get rid of it.

3. The *senecio jacobea*, or rag-weed, which is a biennial, is very troublesome in old leys, and abstracts much of the riches of the soil. It is most effectually destroyed by cutting it down with the scythe, immediately before it flowers; and then it will form an useful addition to the dunghill.

4. The *achillea ptarmica*, or sneezewort, is a very pernicious weed, especially in tilly and loamy soils.—It would seem that it can be eradicated only by an improved mode of culture, and the application of proper manures.

5. The various kinds of *grasses* which infest the soil, can be exterminated by fallowing courses only.

6. The *ranunculus arvensis*, crowfoot, or *sil-sicker*, as it is here called, is very common, very hurtful, and very difficult to extirpate. Frequent ploughing, and

the enriching of the soil by proper manure, seems to be the most certain method of getting rid of it.

7. In light dry soils, the most troublesome of all weeds is the *artemisia vulgaris*, here called *mugwort*: its large branchy roots adhere obstinately, and form a matt which must be torn up by the plough, and removed carefully from the ground. In fields which have been long left under grass, this plant dwindles away, so as to occasion little mischief: but, on their being again brought into tillage, it gradually recovers its former size and strength.

8. In dry field stubble-grounds, the *geranium dissectum* occupies much space. It is an unprofitable weed. The mode of extirpation seems to be the amelioration of the soil by culture, and by manuring.

## II. ANNUAL WEEDS.

Of the annual weeds, the most frequent and the most noxious in this district are, the *serratula arvensis*, or cursed thistle; the *onopordum acanthium*, a large and very prickly kind of thistle; the *souchus arvensis*, or sow-thistle; the *chrysanthemums*; the *centaureas*; the *agrostemna githago*, &c. With regard to these, the most common practice is, during the summer, to pull them with the hand, and to lay them in heaps to rot upon the ground. But, besides that there is a risk of pulling some of the corn along with them, or at least of injuring the roots in some degree, it may be observed, that the most part of these plants are of so succulent a nature, that even though they are pulled some time before

fore they have ripened their seeds, these are afterwards ripened upon the spot where they had been thrown; and the seeds being, in almost every instance, furnished with wings (*pappus*) are carried about by the winds, and infect the soil for years to come.

It is submitted to the judicious agriculturalist whether it would not be better to cut these annual plants over, near the root, just about the period when they are forming the flower:—the root cannot, for that year, renew its stem; or, at the most, it can send forth only a few slender fibres: the seed is not perfected; and the whole plant perishes with the winter. It is of importance to remark, that plants, especially of the annual kind, when cut over before the period of perfecting the flower, bleed off their juices and die.

The Reporter has to add, that, on his own little farm, he has practised this method with success for several years, with regard to the serratula, and that still more formidable enemy, the onopordum. Just before they perfect their flower, he employs his servant to cut the weed with a coarse sharp knife, as near the ground as possible, and it is calculated that he can cut *three* thistles in the time that he can pull *one*; besides that no injury is done to the roots of the corn.—It is left to every one to act in this matter as he judges best: the thing seems, at least, to merit a trial.

As to the smaller weeds that infest arable soils, such as the veronicas (speedwell) the alsine (chickweed) the lamium (dead nettle) thlaspi (shepherd's purse) the sinapis nigra, brassica rapus, raphanus raphanistrum (wild mustards) arenaria, sagina, &c. &c. it is unnecessary to

say much : their prevalence is often owing to ill culture, and the poverty of the soil, which may be corrected by various means. The *rumex acetosella*, or sheep's sorrel, is effectually destroyed by the application of calcareous substances. In speaking on the subject of WEEDING, the true theory seems to be, to pulverize the soil, and to enrich it by proper manures.

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#### SECT. II.—FALLOWING.

THE operation of *Fallowing* is practised in Stirlingshire upon a very extensive scale. In the carse grounds, it comes in uniformly as a part of the rotation, as will appear from the section immediately following. In all strong and adhesive soils such as these, it becomes indispensably necessary, in order to pulverize the ground, to kill noxious weeds ; to relieve the land, by rest, from the exhaustion of uninterrupted cropping ; and to expose successive surfaces to the action of the air and of the light.

Having proceeded thus far, it occurs, that, in order to illustrate this, and some of the agricultural processes which follow, with proper effect, it may be of service to suggest *shortly* some chemical principles of obvious application, and with which even the practical farmer should be, in some measure, acquainted. It is well known, that, in every art of life, the deductions of science

science have shortened and facilitated the ordinary processes.—What is the experience of the farmer, on which he rests his operations, but the plain conclusions of common sense, from facts which he and his forefathers had observed? Philosophy proceeds precisely in the same way: it collects, and arranges, and applies facts, but by a much quicker and surer method than could be done by the random experience of generations.

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### *Chemical Principles of Vegetation.*

When the seed is cast into the ground, it undergoes the process of *malting*, which is nothing else than the first appearance of the new plant springing up from the fermenting mass of the parent seed. As the plant advances, it is fed by similar processes;—by inhaling certain kinds of air; and by incorporating with itself certain earthy and saline substances.

By a wise arrangement of nature, the destruction of one race of vegetables is made subservient to the reproduction of another. By a chemical process, all vegetables may be reduced to a state of putrefaction; and then they restore to the earth the matter of which, in their living state, they had robbed it.

The richest soil, by being subjected to a perpetual series of exhausting crops, may be so much robbed of



those particles which enter into the composition and nourishment of plants, as to become incapable of yielding profitable returns. The great object of the farmer is so to manage his land that it may yield the greatest increase of which it is capable.

There are various processes by which this may be most effectually done. Some of these depend on the ordinary *operations of nature*, assisted by human industry: others again are altogether *artificial*, such as the application of manures;—of this last, notice will be taken under chap. XII.

In speaking of the *ordinary operations of nature* in promoting vegetation, it may be observed, that the air which we breathe, and which is also necessary to the growth of plants, is composed of certain subtile substances, called *gases* by chemists. It may be stated shortly, that oxygen gas, or vital air, constitutes nearly 25 parts in the 100 of the atmosphere; nearly 75 parts are composed of azote, which is unfriendly to animal life; but it enters copiously into the food of plants.

Besides these two great constituents of the atmosphere, there is, as has been remarked on a former occasion\*, continually floating in it, a small portion of carbonic acid gas, which enters largely into the food of vegetables: Mr Kirwan has observed, that there are certain vegetables which exhaust this gas, whether applied in the form of lime, or otherwise, more rapidly than others; and that these vegetables, when analysed,  
yield

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\* See note, p. 102.

yield again the greatest quantity of carbon. He instances, in the order in which they exhaust carbon most copiously, 1. wheat; 2. barley; 3. clover grass. — When speaking of the culture of these plants, the application of this doctrine will be attempted.

The nitrous acid gas is found also to exist in the atmosphere in a small portion\*. It consists of oxygen, with azote for its base. It is productive of very important effects in the economy of nature. In Spain, for example, nitre, or salpêtre, is obtained by collecting the refuse of the streets into heaps. After this has been, for some time, exposed to the atmosphere, it is thrown into perforated vessels, with the addition of wood-ashes, as an alkaline base. Water is poured on, and filtered through; the crystals of nitre are formed by evaporation. The same matter, being again exposed to the atmosphere, is re-impregnated with nitre; and thus the process may be continued without end.†

All this serves to prove that certain substances exist, already formed in our atmosphere, which contribute to the growth of vegetables:—these natural acids, by combining with an earthy or alkaline base, form saline substances, which are the proper food of plants. Hence it necessarily follows, that, by proper applications to the soil, it is in the power of the husbandman to increase the production of these substances; and to concentrate, as it were, upon the surface of the earth, the fertilizing influences

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\* Dr Home's Principles of Vegetation, p. 142.

† The Rev. Mr Townshend's Travels in Spain.

influences of the air. This subject will recur when treating of manures.

It may be added, from the observation of facts, that there appears to be some inherent quality in solar light, which has a powerful effect in promoting, and in perfecting vegetable life. Chemical science does not seem, as yet, to have advanced so far as to analyze this influence, or to account for it. Its effects, however, are remarked by the most unenlightened. Cultivate any plant, the potatoe for example, in the dark, it will vegetate; but it will not possess either the colour or the flavour of its kind. Solar light seems to be indispensably necessary to communicate their proper qualities to vegetables. There seems even to be reason to conclude that the rays of solar light possess some property analogous to the ærial acids; and that, combined with certain qualities of the soil, they contribute to form saline substances, the food of plants.\*

Thus,

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\* This idea is taken from a hint suggested, and merely suggested, by M. Berthollet, in an Essay on Bleaching, published in the *Annales de Chymie*. He observes, "that there seems to be a striking analogy between the solar rays, and the oxygenated muriatic acid, now used in bleaching, both in their nature and effects." The truth is, that the effect produced by the rays of the sun upon the coloured parts of bodies is altogether similar to that produced by the above-mentioned acid. The former more slowly, and the latter more rapidly, destroys the colour of cloths, and performs the operation

Thus, then, it appears that bountiful nature has furnished, without the co-operation of man, very liberal stores for the improvement of the soil. It is true, that these are too scanty to supply the great exhaustion of vegetable particles which takes place in lands held in regular tillage. Here, applications furnished by human industry must come in to the aid of nature, such as manuring, fallowing, &c.\*

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operation of bleaching. Formerly this operation was performed slowly by the application of an alkaline ley, joined to long exposure to the sun. By the late discovery, it is performed quickly by the oxygenated muriatic acid, with the addition of an alkaline ley. In both cases, the principle seems to be the same: in both, an alkaline base is necessary; in both, the presence of an acid is necessary, to form a neutral salt. In the one case, this acid is furnished slowly, by the rays of the sun; in the other, it is applied at once, in its more concentrated form.

\* It is hoped that the practical farmer will forgive the introduction of these few simple principles of science. They were originally offered, with some ideas of a similar tendency, which will afterwards be brought forward, in an Essay presented to the Board of Agriculture in 1801, on the subject of "the best method of converting old grass lands into tillage, and of returning them into grass, in an improved state." This Essay obtained the approbation of the Board, with the silver medal.

In considering the operation of FALLOWING, it may be observed, that chemists teach us, that when substances which are chiefly, or totally inflammable, are, for a long period, exposed to the atmosphere, the action of the oxygen gas gradually deprives them of their principle of inflammability, and reduces them to an inert state, in which they are unfit for nourishing vegetables. We have a familiar example of this in the surface and parings of peat-earth, which, by this process of oxygenation, becomes unfit either for fuel or vegetation. Even dung itself, by being long exposed to the atmosphere, becomes inert, and is converted into a species of peat.

Lord Dundonald, in his ingenious treatise on *the application of Chemistry to Agriculture*, seems to have been led into an error, in reasoning from these principles, however just. He condemns *fallowing*, in almost every instance, from the notion that the soil becomes oxygenated by long and frequent exposure to the atmosphere, and is consequently rendered inert. His Lordship indeed professes, page 59, quarto edition, "that the most prominent feature of his work is the unfriendly effect with regard to vegetation, which is produced by the exposure of the soil to the air."

When his Lordship, again, attributes the exhausting effect of narrow-leaved crops, as oats, barley, and wheat, to their affording little cover to the soil from the air, and the meliorating effect of broad-leaved crops, as pease and turnips, to their preventing oxygenation, by covering the soil,—his argument appears to be partly, and only partly, just. Broad-leaved crops prevent the oxygenation of the particles of manure, and other inflammable

flammable substances contained in the soil; but it would seem that the great and leading difference between broad and narrow-leaved crops, with regard to their effects on the soil, are, *first*, that the former confine the carbonic acid gas, the food of plants, near the surface of the earth more than the latter; and, *secondly*, that broad-leaved plants derive a great portion of their nourishment from the atmosphere, and the narrow-leaved, principally from the earth.

It appears further, in speaking on this subject, that Lord Dundonald has not sufficiently adverted to the circumstance,—that the soil, or mould of earth in which vegetables grow, consists, for the most part, of substances which are *un inflammable* (and, consequently, incapable of oxygenation) such as clay, calcareous earths, &c. These substances, by exposure to the atmosphere, are gradually impregnated with the natural acids of which mention has been made, and are thus rendered more fit than before for the purposes of vegetation. Hence the utility of *fallowing*, by exposing the soil, during a proper period, to the influences of the air and of the light.

In the carse of Stirlingshire, summer fallows are ploughed with a strong furrow, from four to six inches deep: they are ploughed from four to six times during the season; and it is reckoned by intelligent farmers, that the oftener they are ploughed the better.

It is reckoned that the strong loamy land of Kilsyth, when continued under crop, will require a fallow every sixth or eighth year.

When

When lime is applied to fallow, as is very generally done in the carse, it is laid on immediately before the last ploughing, and the last furrow is taken thin; so that the lime, which has a natural tendency to descend, may not be buried too deep.

In light arenaceous soils, Lord Dundonald's doctrine of the hurtful effects of oxygenation may be admitted to hold. Here fallowing seems to be unnecessary and improper; and accordingly, in the Highland district of Stirlingshire, it is almost unknown. In such soils it would seem that less is gained than is lost by the influence of the atmosphere: these soils require chiefly copious additions of manure.



#### SECT. III.—COURSE OF CROPS.

THE proper rotation of crops is a consideration of the highest importance to the farmer. Some kinds of grain, as has been noticed, soon exhaust the soil of its nutritive qualities; whilst others contribute to ameliorate it, or, at least, exhaust it in an inferior degree. In no situation ought this circumstance to be more attended to than in the carse of Stirlingshire, which are held, almost constantly, under tillage: yet there, a proper course of cropping is too frequently neglected. The indispensable

indispensable operation of fallowing, especially, is too often omitted,—the farmer grudging the loss of a year's crop, though he knows that the produce of the ensuing year would yield him an ample compensation.

In detailing the ordinary rotation of crops practised in Stirlingshire, of which very full and accurate documents have been obtained, the most proper method seems to be, to give tables exhibiting the particular district of the county, the soil, and the rotation of crops usually observed. By comparing the practice of different adjacent districts, the occupants of each may learn what to reject, and what to adopt from each other.

#### TABLES of the Rotation of Crops in Stirlingshire.

I. In the Dryfield lands of the county, comprehending Buchanan, Drymen, Fintry, Killearn, &c. the course, when it can be accomplished, is, or ought to be, as follows :

After grass, 1st year	Oats.
2d	A green crop.
3d	Barley, with grass seeds : or sometimes wheat.
4th	Hay.
5th and 6th	Pasture.

II. Turning to the northern aspect of the Lennox hills, the Reporter finds, that in the carse grounds lying to the west of Stirling, a course, or *shift*, as it is here called, of six years, is practised, as follows :

1. A



1. A summer fallow.
2. Wheat.
3. A green crop.
4. Barley, with grass seeds.
5. Hay.
6. Oats.

III. In the Carse of St Ninian's, the Rotation is,

1. Fallow.
2. Wheat.
3. Beans.
4. Barley, with grass seeds.
5. Hay.
6. Oats.

IV. In the Carse of Airth, Bothkennar, Falkirk, and Polmont, it is,

1. Fallow, with lime.
2. Wheat.
3. Pease and beans, sown broad cast, with dung.
4. Barley, with grass seeds.
5. Hay.
6. Oats.

Sometimes a second crop of oats is taken on the seventh year; but this practice is not approved of.

V. Mr Walker of Falkirk, one of the most intelligent agriculturalists in the county, has adopted a course somewhat different from the above; it is,

1. Fallow

1. Fallow, with lime, provided that the ground has not been limed within 20 years before \*.
2. Drilled beans with dung.
3. Wheat.
4. Potatoe-oats, with three or four ploughings, and, grass-seeds.
5. Hay.
6. Oats.
7. Fallow.

Mr Walker's difference of practice is founded upon the opinion, that in the rotation marked No. IV. the 3d and 5th courses come too near each other, both consisting of green crops, and requiring the same food from the earth and the air.

N. B. Sometimes, after the crop of hay is taken off, the ground is broken up; half a fallow is given to it; and a crop of wheat is taken with success.

This may perhaps be the most proper place for taking notice of a circumstance in agricultural economy which is not always sufficiently attended to even in the Carse of Stirlingshire, the utility of frequently *changing the seed* which is sown. Whatever be the philosophy of

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\* Why Mr W. adopts such an unfrequent use of lime, the reporter cannot state. If there be any foundation for Mr Kirwan's idea of the great exhaustion of calcareous matter by certain vegetables, one should think that a crop of wheat and of clover and of oats would exhaust the lime sufficiently in the course of seven years.

this matter, it is certain that every kind of seed degenerates, by being sown in the same place for a long succession of years. By being exchanged for seed procured, perhaps at no great distance, the quality as well as the quantity of the produce *is known* to be improved. It seems to be an unreasonable idea, (though maintained by some) that seed should be brought from a poor to a richer soil, in order to bring the greatest increase. Animals are improved in their quality, by being removed from a poor to a rich soil; and so, no doubt, grain will, in some measure, be. But the just theory concerning seed seems to be, that by sowing the most perfect in its kind, the most abundant returns may be expected. The reporter has, indeed, met with a theory of an opposite tendency advanced, particularly with regard to oat-seed, "that, though not fully ripened, or well filled, it makes good seed." Neither philosophy or experience confirm this doctrine. "*Fortes creantur fortibus et bonis*.\*"

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#### SECT. IV.—WHEAT.

WHEAT has been cultivated for time immemorial in the Carse of Stirlingshire; and being found the most profitable.

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\* Horace, Od. L. iv. 4.

profitable of all crops, from the smallness of the measure, and the high price which it brings compared with that of barley or of oats, the culture of this grain is now rapidly extending itself towards the very western extremity of the county. About 16 years ago, there was little or no wheat sown in the rich soils of Kilsyth; there are now upwards of 100 acres cropped annually with this grain.

The preparation for wheat varies according to circumstances. In general it is sown after a summer fallow, with dung or lime, or with both together. From 40 to 50 carts of dung are given to an acre, and from four to eight chalders of lime; the quantity varying according to the quality and condition of the soil. As it is seldom that the occupier of an extensive farm can, in the same year, procure lime and dung sufficient to manure all his wheat land, it is an ordinary practice to give lime to the one half and dung to the other.

Wheat is also frequently sown in the ground where potatoes or turnips had been raised that same season. These crops, by the various operations which they had undergone, are found to furnish a sufficient fallow. An additional dose of manure is generally given.

It is not uncommon, after taking a crop of hay off ground which had been laid down the preceding year in grass, to plough down the second crop of clover when it has become luxuriant, and to take a crop of wheat. The clover serves as a manure to the wheat, being, as has been found by chemists, richly impregnated with calcareous matter. A gentleman, however, who has practised this method, finds that wheat sown

after clover is frequently infested with snails upon its appearing above ground.

As to the season of sowing wheat, it is extended in this county, from the beginning of September to the middle of December, according as the weather and other circumstances admit. Spring wheat has been lately introduced, which is to be sown in February or in March; but it has been hitherto cultivated in so few instances that the reporter does not consider himself qualified to speak of its merits.

Over all Stirlingshire, wheat is sown broadcast. In all the Carse, and in the loams of Kilsyth, wheat is *harrowed* into the ground; in some of the light loamy soils of Campsie, it is *ploughed* down with a very thin furrow.

Wheat used for seed is almost universally steeped immediately before sowing, as a preventative against mildew, smut, and other diseases. The steep is either water impregnated with salt to such a strength that an egg will swim in it, or chamber ley or urine; whilst it remains in this pickle, (which is for two or three days,) the weaker grains which, upon stirring, rise to the surface, are carefully skimmed off; and when the seed is taken out of the pickle, it is dried by spreading it on a floor, and by sprinkling quicklime over it.

Whether the effect of preventing disease in the future crop is occasioned by the separation of the weaker grains from the more perfect (which could be done equally well by steeping in pure water,) or by the absorption of certain matters from the pickle, which destroy the tendencies to disease, it is impossible to determine,

mine, in the present state of natural science. It is sufficient, however, to induce every prudent farmer to adopt the practice, that it has been found effectual for the purpose for which it is intended.

It may be permitted, at the same time, to add, that the intelligent agriculturist, Mr Walker of Falkirk, *never steeps* his wheat seed, and that yet he is seldom or never troubled with the smut, or any other disease in his grain. His method is to sow the seed of the *preceding year*, which he finds to answer best in many respects, and *particularly* in this, that it appears to prevent disease in the grain. Perhaps it may be, that the cold of the preceding winter has had the same effect with the pickle in destroying the tendency to disease, whether arising from *mucor*, or from *animalculae*, lodged in the grain. It was fortunate for Mr Walker, that in the autumn of 1808, he sowed the seed of 1807, which was of a much fuller and stronger grain than that of 1808. In November 1808, when the reporter saw his farm in Bothkennar, his young wheat exhibited a much stronger fibre, and a brighter green than that on the adjacent fields, which had been sown with the feebler grain of the same season\*.

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\* It is of importance to take notice of a fact tending to recommend a similar practice, stated in a letter from Sir John Sinclair, Bart. and inserted in the Farmer's Magazine No. 33. p. 16. "That Mr French of Essex constantly sows old wheat, and is never troubled with the smut." Mr Arthur Young.

In detailing the minuter operations of the harvest, (which it will not be necessary to do at great length,) it is intended in this section to offer every thing that relates to wheat, oats, barley, and the other grains ordinarily cultivated in Stirlingshire.

In *reaping*, the sickle is universally made use of. An evident improvement of the sickle is now very generally introduced. The old sickle, which is still most frequently used, is teathed somewhat like a saw; the teeth soon wear out, and, for the most part, the sickle is henceforth useless, unless the teeth be renewed on the anvil. The improved sickle is broader in the blade; it has no teeth, and is of a better metal; on the principle of the scythe, it is sharpened from time to time by a stone. It cuts with more ease than the other, and lasts for a much longer time.

By the sickle the grain is, no doubt, cut down more regularly, and is more easily collected into sheaves than by any other method, but the operation is slow, and it requires many hands. It would be perhaps the most important acquisition to agricultural operations that has been made for a long while, if an instrument were invented, by which corns could be cut down, and at the  
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Young states, "that he never steeps his wheat." When the trouble and expence of steeping and of drying the seed with quicklime are taken into the account, it would seem that Mr Walker's practice should be subjected to the proof of more frequent experiment. The philosophy of the subject is in its favour.

same time gathered into sheaves, as hay is cut down by the scythe. In grounds completely level and free from stones, like the Carse of Stirlingshire, an estimate might at least be made of the proportional expence, whether by *labour* or by *loss*, of reaping corns with the sickle or with the scythe.

The size of the sheaves is proportioned to the length of the straw. In wet seasons they are not made large. Twelve of these in oats and barley, and fourteen in wheat make a shock, or, as we call it, a stook. In placing the stook, attention is paid in this climate, as ought perhaps to be done in every other, throughout the kingdom, to the point of the compass from which the storm or weather most generally blows. If the side of the stook be placed towards this point, the greatest possible surface is exposed to the weather, and the corn suffers accordingly; the end of the stook therefore is presented to the weather. In this district, from the circumstances which have been already mentioned with regard to the climate, the stook is generally placed in a direction from S. W. to N. E. In narrow vallies, and where hills and woods interfere, there may arise a difference of the currents of air, and in such situations experience must guide.

On account of the succulent nature of beans, pease, and other leguminous plants, they are left loose upon the ground for sometime before they are bound up into sheaves, that they may lose in part their superabundant juices.

In very wet and unfavourable seasons, a method is practised in this county, which perhaps is not much



known elsewhere, and may be shortly stated. The sheaves, instead of being set up in stooks, are set up singly on the lower end, the band being slipt up near the top, and the middle opened and exposed loosely to the current of the air. This method is here called *gaiting*. It is had recourse to only in extremity; there is much loss sustained by the exposure of the ears of corn to the weather and to the birds; but if there be only a few hours of drought and sunshine, the victual will not be finally lost.

When the sheaves are exhausted of the moisture which had remained in the stalks, or which they had imbibed from the weather, they are built up into large ricks or stacks, of a circular form, and with conical tops, the eaves, at the commencement of the top, projecting over the body of the stack to ward off the rain. The conical top is thatched with straw. These stacks contain from 30 to 90 or 100 thraves of victual, a *thrave* being two stooks. No great quantity of grain is put into the barn at once; it is safer in the stack from the depredations of vermin.

To preserve the grain as much as possible from vermin, the stacks on every farm, conducted upon a proper system, are placed upon wooden frames, fixed upon pillars of stone 18 or 20 inches high, and on each pillar there is a flag-stone projecting over it several inches. By this means vermin are effectually prevented from ascending into the body of the stack. In rainy seasons frames of wood are sometimes placed perpendicularly in the stack, to preserve them hollow, and to afford a free circulation of air throughout.

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Though thrashing mills are now very generally introduced upon every considerable farm, much work is still performed by the flail. Wheat straw, being too coarse for the food of cattle, is almost exclusively used for thatching and for litter. The straw of barley is very generally used in the same way. The straw of oats and of pease is used as provender.

With regard to the *manufacture* of these different kinds of grain, it will not be necessary to enlarge, the practice being nearly the same as in other parts of Scotland. Every district of the county is amply furnished with mills, constructed in the proper form, and furnished with apparatus suited to every necessary operation:

Flour, or the meal of wheat, is most generally made into loaves fermented with yeast.

The meal of oats, which is more used as a food in Scotland than perhaps in any country of Europe, is not fermented when made into bread; but, being mixed with a proper quantity of water, is kneaded into dough, and this is beat out into thin cakes, which, after being heated on a circular plate of iron, are toasted by the fire till they turn brittle. In Scotland, oatmeal boiled, and stirred about in water, is formed into a kind of pudding called *porridge*, which, with milk or beer, is the ordinary breakfast of all the common people. When well boiled, this is a very wholesome and nutritive food.

Another preparation of oatmeal, much used, especially in the western parts of this county, is *sowens*. It is made by pouring hot water upon oatmeal, or upon a mixture of meal with the husks produced in grinding. It is left in the vessel for a few day days until it be-

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comes acidulous: It is then poured off, and boiled to the consistence of jelly. It forms a light and wholesome food. Dr Beddoes observes, that "by the use of soins, or sowens, one of Captain Cook's most intelligent friends, cured his scorbutic sick on board his ship \*."

The grains of oats, freed from their husks, are frequently used in making broth, instead of barley; this preparation of oats is called *grots*.

Of the *stubble* of grain, the reporter can learn no use that is made in this county, except that of ploughing it down; and this is probably the best purpose to which it can be applied. In Carse grounds especially, the strong stubble ploughed down serves to keep the ground open, and when it at length rots, it adds to the manure. The burning of stubble has been suggested, and it is in some places practised; but when it is considered that the ashes furnish only a very minute addition to the soil, (not more than one part out of 20 of the substance burnt,) it is not probable that the practice will be generally adopted.

The greatest part of these details may appear uninteresting and unnecessary to an inhabitant of Stirlingshire, to whom they are minutely known. But, besides that such details are required by the Board, and that it is proper that every treatise should be so complete in itself as to supersede the necessity of reference to other sources

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\*. Observations on the nature and cure of calculus, scurvy, &c. by Dr Beddoes, Lond. 1793, page 90.

sources of information, it may happen that this may fall into the hands of persons who may be disposed to form comparisons between the different methods employed in conducting these operations.

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## SECT. V.—RYE.

Of this grain there is almost none cultivated in Stirlingshire.

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## SECT. VI.—BARLEY.

MUCH of the detail of the operations which concern this grain, as well as those which follow, has been necessarily anticipated in Sect. iv. A few remarks will here suffice.

Barley ground is ploughed at least three times : even potatoe ground is ploughed once at least ; one of these should be a cross ploughing ; it is manured as in the

the case of wheat. Barley is universally sown broadcast, and is, in almost every instance, accompanied with clover and rye-grass. The ground is rolled immediately after sowing, if the soil is dry; if it is wet, it is rolled after the blade has come up. By this last method, many grains are saved and permitted to spring up, which, had the land been rolled in its wet state, would have been pressed down and lost in the compacted soil.

Almost all barley is mixed with some portion of bear or big. In the higher parts of the county, bear alone, without any mixture of barley, is found to answer best, being a coarser and hardier grain. It does not bring a price equal to that of barley by a few shillings.

Barley is sown in the end of April or beginning of May. This grain is much cultivated in the dry-field lands of this county; but since the more general and more profitable introduction of wheat, it is not so much cultivated in the Carse, especially those to the east of Stirling, as in former times. Mr Walker considers his land as too good to be employed under a barley crop, which, as will be seen from the tables of produce which shall be added, yields only about eight bolls per acre, whilst potatoe-oats yield twelve and sometimes fourteen.

There was much malt made formerly in this county, in which there were several extensive distilleries. In the parish of Kippen alone, there were, previous to the late prohibition of distilling from grain, twenty malt-barns. Their number is at present greatly reduced.

The price of barley varies here as in other counties. In general, it is a little lower than in the Haddington market.

SECT.

## SECT. VII.—OATS.

FOR oats, which are most commonly sown in lands that had been in grass, only one ploughing is given, and that frequently in the beginning of winter, the succeeding frosts contributing to render the soil friable. In light soils potatoe-oats are frequently put in without ploughing, in land where potatoes or turnips had been raised the preceding season. It is essential, however, that the ground should be turned up into furrows immediately after the potatoes or turnips are taken up.

When any manure is given to oats, it consists of a top-dressing of lime or dung. The latter is called *teathing* in this county. Of these methods mention will be made under the article of *manures*.

Oats are sown in February, in March, or early in April, and always in broadcast. Different kinds of seed are used, as Blainslie, Coupargrange, and potatoe-oats. This latter sort has, of late, come into very general use. It is an early oat, a circumstance of great importance in so precarious a climate as this is. Like other kinds of early oats, its straw is less abundant than that of late oats, but it is more plentiful in grain. Potatoe-oats require a soil in rich condition. There they yield a great return; the husk is thin, and the farinaceous part plump and heavy. It is remarked, that when other kinds of

oats

oats yield only 16 pecks of meal, potatoe-oats generally yield 18 pecks. The Flemish oat, possessing nearly the same qualities, has been lately introduced.

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SECTIONS VIII. & IX.—PEASE AND BEANS.

THESE two kinds of grain being generally sown together, at least in the Carse of Stirlingshire, it may be permitted to bring them under one head. When mixed, as they for the most part are, they are sown with dung in February or March. The pease are in the proportion of one-third or one-fourth; the advantage of sowing them mixed is, that the pease throw their tendrils around the strong stalk of the bean, and are prevented, in this rainy climate, from falling to the ground and rotting.

Pease are sometimes sown alone, in the dry fields, in the western part of the county; in a dry season they succeed; in a wet one they are often lost.

Beans also are sometimes sown alone; in this case they are sometimes drilled, as is the practice of Mr Walker of Falkirk. In the Carse of Gargunnoch, Polmont, and Larbert, they are sown broadcast.

From the precariousness of the climate, these succulent plants do not always succeed, and are but little cultivated

tivated in the higher parts of Stirlingshire. They are understood to improve the soil, by confining, as has been already suggested, the gases which promote vegetation, with their broad leaves ; and by their deriving, like other leguminous plants, a considerable portion of their food from the atmosphere, as well as from the earth.

The common horse-bean is most generally sown. The late pea is sown in March ; the gray Hastings pea, an earlier kind, in April.

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#### QUANTITY OF GRAIN SOWN, AND PRODUCE PER ACRE.

HAVING offered these remarks with regard to the general practice of this county in the cultivation of wheat, barley, oats, pease, and beans, the grains almost exclusively cultivated in Stirlingshire, this seems to be the proper place for stating the quantity of each which is generally sown, as well as the returns generally yielded by the Scots acre. In a district of such various soil and climate, it is impossible to give an estimate that will answer to every situation. It must suffice to offer an average reckoning, taken in different parts of the county,



**I. The quantity of seed sown per acre.**

1. Wheat, from 8 to 12 pecks, according to the soil.
2. Barley, from 8 to 10 pecks, sometimes 12 pecks.
3. Oats, one boll and sometimes five firlots.
4. Beans, one boll of 3 firlots, sometimes 4 firlots.

**II. Produce per acre.**

1. In the Carse west from Stirling, an acre yields :  
Wheat, from 7 to 9 bolls.  
Barley, from 5 to 7 ditto.  
Oats, from 5 to 7 ditto.  
Beans, from 4 to 7 ditto,—always an uncertain crop.
2. In the Carse of Falkirk, Airth, Bothkennar, and Polmont, an acre yields ;  
Wheat, 12 bolls, and in well fallowed land sometimes 16.  
Barley, 8 bolls.  
Oats, 11 bolls.  
Potatoe-oats 12, and and sometimes 14 bolls.  
Beans, 8 bolls.
3. In the loams of Kilsyth, Campsie, &c. an acre yields :  
Wheat, 12 bolls.  
Barley, 6 bolls.  
Oats, 6 bolls.

**SECT.**

## SECT. X.—TARES.

TARES are sown, to a very small extent, in the loamy soils of Kilsyth, Campsie, Buchanan, and some other places. It is to be regretted that they are not cultivated upon a much larger scale, as they enrich the soil, furnish a rich food for milch cows in the interval between the first and second clover crop, and, by assisting the summer feeding within doors, contribute to increase the dunghill. It was suggested to the reporter by a gentleman of this district who cultivates tares upon a small scale, "that they should not be used till the seed is nearly formed, as they furnish at that time the richest and most nutritious food." The seed of tares is never preserved here, as they are always used for stall feeding.

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## SECT. XI.—LENTALS.

THESE are unknown in the husbandry of Stirlingshire.

## SECT. XII.—BUCK-WHEAT.

BUCK-WHEAT, the *polygonum fagopyrum* of Linnaeus, is little cultivated in Stirlingshire. The reporter never observed it, except at Buchanan, the seat of his Grace the Duke of Montrose, where it is sown as a food for pheasants which have been introduced there. It is an excellent food for poultry, and even for swine. Its culture deserves attention. May it not be advantageous as a preparation for wheat, serving the same purpose, when ploughed down in its succulent state, that the second crop of clover does?

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## SECT. XIII.—TURNIPS.

THE introduction of turnip husbandry, which is only of recent date, forms an important æra in the annals of Scottish agriculture. With regard to the merits of this department of husbandry, they are unquestionable.

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By the culture of turnips the soil is cleansed, and at the sametime ameliorated. Cattle are fed for the butcher, and for the dairy \*, with succulent food, after the grass crop has failed ; and the quantity of dung is increased by stall-feeding.

Some doubts were, at one period, excited in the reporter's mind by the accounts which he received from many intelligent agriculturists of this county with regard to the *exhausting* effects of a turnip crop. In the fine loamy lands of Campsie, he learned "that ground, which had born a crop of turnips, does not, the ensuing year, produce nearly so good a crop of wheat as that which had been under potatoes ; and that, consequently, turnips are now cultivated in that district on a reduced scale, whilst the quantity of ground laid down with potatoes is tripled." In the dryfields on the Endrick, a farmer reports, that a field laid down, the one half with potatoes, and the other with turnip, was sown the ensuing year with flax : that which grew on the potatoe ground was one fourth better than that on the turnip ground.

On the other hand, a great number of the most intelligent gentlemen with whom the reporter has had

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\* It is pretty generally known (and this knowledge should be more universally carried into practice,) that the disagreeable flavour occasioned to milk and butter by turnip feeding, is completely removed by the addition of a small quantity of nitre.

an opportunity of conversing, are decidedly of opinion that if an equal quantity of dung, and equal pulverization, be given to turnip ground as to potatoe ground, the ensuing crop will be equally good. Captain Davidson of Kilsyth farm, who occupies above three hundred acres of fine loam, generally lays down every year about 14 acres with turnips, which are succeeded by a good crop of potatoe-oats, with grass seeds. He observes no deterioration of the soil from turnips.

The question, in short, seems to reduce itself to this, that if the soil is, in any instance, impoverished by a turnip crop, this is occasioned, in the first place, by its receiving a smaller quantity of manure than is given to potatoes, (as is generally the case,) 2dly, by the inferior degree of pulverization given to turnip ground, in the last stages of the crop; and, lastly, by the poaching of the ground in taking up the turnips. Were all these circumstances equal, it would seem, on physiological principles, that potatoes are the more exhausting crop of the two; the turnip has the largest leaf; it confines more of the carbonic acid gas on the surface of the ground; it imbibes more nourishment from the atmosphere and less from the soil; and it contains a much smaller quantity of farinaceous matter.

On the subject of this crop it is necessary to remark, that many soils in this county appear unfortunately to be ill adapted to its culture. The proper soil for turnips is a dry and arenaceous soil, or a dry loam. The subsoil, too, must be attended to. Where the subsoil is an impervious till, or rock, the ground is poached in carrying off the crop, and, especially, injured by cattle,

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if the turnips are fed off upon the ground. Water in this case lodges in the winter in the pits that are formed; the soil is chilled, and rendered unproductive.

An intelligent gentleman \* in the western district of Stirlingshire, deeply versed in the principles of chemistry, together with their application to agriculture, observes, "that little of the land in this county, to the west of Falkirk, by Stirling, Kippen, Balfron, and Killearn, is favourable for turnip husbandry, because the soil is, *in general*, heavy, wet, and spouty, and lying on a rock or till impervious to water; that he persevered for many years in cultivating turnips, but was obliged to desist, on account of the obvious deterioration of the soil by poaching; nor has it, even after an interval of many years, recovered its fertility; that turnips, therefore, cannot be cultivated in this district with advantage, except in a few favourable patches of land, which here and there occur."

One exception at least, of a soil favourable for turnip husbandry, the reporter met with in the estate of Dr Moir of Leckie, in the parish of Gargunnock. Dr Moir cultivates turnips to a very considerable extent, and with complete success; the account of which seems to be, that his dryfield land is free from a tilly subsoil, that it is in good order, and well pulverised.

In the Carse of Stirlingshire, turnips are cultivated on a very limited scale. It is obvious that the close

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\* Archibald Stirling of Garden, Esq.

compacted soil of these districts is not suited to the cultivation of this plant. There are few cattle fed in the Carse; and the land can be more profitably occupied in raising grain. "Turnips and flax," as a sensible agriculturist observes, "are not much used in the Carse, though most people have a small quantity of both; but the soil is not adapted to them."

To conclude this subject, it may be remarked, that a very great proportion of the higher parts of this county consists of dry field of an arenaceous or loamy soil, the best suited of all others to the cultivation of this important plant. These being properly occupied in turnip husbandry, may perhaps supersede the necessity of forcing this crop against nature in the Carse; and even should a turnip crop be required in the lands of an unfavourable subsoil which have been alluded to, the disadvantages of nature may possibly be overcome by industry. To prevent the poaching of the ground, the turnips may be carried off in dry weather at the end of autumn and stacked; and the ground should be immediately turned up in ridges to prevent the lodging of water, and to expose the surface to the ensuing frosts of winter.

With regard to the detail of turnip husbandry, it is too well known to be required here. The first step is the complete pulverization of the soil by repeated ploughings, with the addition of dung. The seed used is either the yellow, the white, or the red, and very commonly the three kinds mixed. It is sown from the 15th June to the 10th July. If sown sooner, the plant would shoot into seed before winter; if later, it would

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not arrive at perfection. It is sown when there is some moisture in the soil, or when a shower is expected. Turnips are universally cultivated in this county by the drill husbandry; they are sown, for the most part, by the drill plough, by which they are also rolled in the process of sowing; they are weeded both by hand and horse-hoeing.

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Of the vegetables enumerated in the Plan of the Board, from Section 14th to Section 19th inclusive, namely, Cole-seed, or Rape, Cabbages, Ruta Baga, or Swedes, Turnip Cabbage, Kol-Rabie, Borecole, &c. some are not cultivated at all in this county, and others upon a very limited scale.

Some gentlemen cultivate cabbages in the field in a small quantity; some plant them in alternate drills with common kale or colewort, or with Swedes transplanted from the seed bed. These last are not generally cultivated, however, and when they are, it is remarked, by an intelligent agriculturist, "that they are for the most part sown too late to come to perfection."

Colewort, or common kale, it is observed, furnishes a very grateful as well as a profitable food for milch cows. The offal obtained by picking off the exterior leaves, and leaving those nearest the centre to expand into a new top, is said to be the most productive of milk of a



good quality, of any food that can be given to cows. A gentleman of this county, who farms upon a liberal scale, states, "that the offal of an acre of kale is nearly sufficient for the summer feeding of six cows in the house;" the value, as food for winter, cannot be easily calculated.

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#### SECT. XX.—CARROTS.

CARROTS, though only introduced lately into this county as a field crop, are cultivated successfully by some enterprising agriculturists; and, where they succeed, they are considered as the most profitable crop of all others. Mr Kincaid of Kincaid lays down an acre with carrots; and the general return is 20 tons per acre. In the year 1807, carrots sold in the Glasgow market at L.5 per ton; a prodigious return from one acre of ground!

Mr Johnston of Alva cultivates carrots to a greater extent than any gentleman in the neighbourhood; he sometimes sows three acres.

The habit of this plant indicates the soil which is proper for it. It pushes its root downwards perpendicularly.

cularly. It requires therefore a deep loamy soil ; it will not thrive in an adhesive clay : a porous subsoil is also requisite ; a tilly bottom destroys it.

It follows also that the soil should be highly pulverized by frequent ploughings. Land which has been under a potatoe or turnip crop the preceding year, and richly dunged, is the most proper. But it should not be dunged again for carrots ; for the consequence will be the breeding of maggots in the plant. The seed is sown by the hand, about the beginning of April, on the surface of drill ridges, formed about the distance of two feet, in a slight groove made for its reception. The carrots, when taken up, are stored in heaps, like potatoes, or put under a roof. No plant is less injured in the ground by frost, on account of the depth to which it penetrates.

Besides furnishing a grateful and nutritious food for man, it affords also an excellent food for cattle, particularly for horses.

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PARSNIPS and BEETS, the subjects of sections XXI. and XXII. are only cultivated in the kitchen garden in this county.

## SECT. XXIII.—POTATOES.

THERE is, perhaps, no plant which, in point of importance, both as to its use and its culture, yields to the potatoe in the agricultural economy of modern times. When we consider the many millions of British subjects who now depend upon it principally for their daily food, we are disposed to wonder how our forefathers supported existence before its introduction; and we must allow, that no detail which regards its culture and improvement can be considered as superfluously minute.—It is hoped that these considerations will apologize for the details which follow with regard to this important vegetable.

The potatoe is the *solanum tuberosum* of Linnaeus. The general character of the whole genus is more than suspicious. The *solanum dulcamara*, which is a native of the western parts of Stirlingshire, is a deadly poison: its flower exactly resembles that of the potatoe.—It is, at the same time, fortunately ascertained, by long experience, that the potatoe partakes in almost no respect of the deleterious qualities of the family to which it belongs: it forms, without question, a most nutritious and wholesome food: it contains more farinaceous mat-

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ter than most of other vegetables used for food. Its introduction into the system of Scottish agriculture, at least, has given a new aspect to society, not only by furnishing a cheap food for the poor, but by opening up new modes of cultivating the ground, and of arranging the rotation of crops.

Still, however, before we quit the subject of the character and qualities of this vegetable it may be permitted to remark, that, under some forms, it exhibits certain slight traits of the solanum family — It is not out of the memory of persons still alive, that, on the first introduction of the potatoe into this country, which is yet a recent event, it was considered as an unwholesome food. This idea has proved to be unfounded. — But it would seem that a certain attention in dressing it is necessary to divest it of every shade of its generic character. Boiling or roasting, it may be observed particularly, are required to render it a proper aliment for the human race. By these operations, it would seem that certain juices are thrown off which are inimical to health, and by the removal of which the vegetable is rendered completely wholesome.

An example may be given in a preparation of the potatoe, which is very common, at least in the western parts of Stirlingshire: it consists in boiling the potatoes, stripped of their skins, in a proper quantity of water, together with a piece of beef or mutton: this dish is there called potatoe soup. This soup, prepared as above, the Reporter can say from his own experience, and that of many on whose testimony he can rely, produces, in many stomachs, a nausea; and, though the degree

is slight, still it is a *degree* of deleterious quality. This effect is completely removed by previously boiling, or at least half boiling the root in water, which is to be poured off:—the potatoes are then to be thrown into the juice of the animal food, which had been boiled in a separate vessel, there to be boiled and macerated anew.

Brute animals do not appear to suffer perceptibly from the use of the unboiled potatoe, or of the water in which it had been boiled. Reasoning from analogy, however, one should be disposed to conclude that it is proper to steam, or scald, or give a half-boiling to potatoes, for the food of horses, cows, and swine.

The potatoe was, as it is believed, first introduced into Europe from America. It appears to have been cultivated in Ireland a considerable time before it found its way into Scotland; and it appears that it was in the county of Stirling that it was first cultivated upon an extensive scale.

From a memoir presented to the Board of Agriculture by Dr William Wright, it appears that potatoes were first planted out in the open field in 1728, by Thomas Prentice, a day labourer in the parish of Kilsyth. But Robert Graham, Esq. of Tamraver, in the same parish, was the first who, in 1739, cultivated this root successfully, in the open fields, to any considerable extent. Potatoes had formerly been planted only in gardens, and in a very small quantity. Mr Graham planted them in such quantities as to be able, in no small degree, to supply the demands of the neighbouring markets. To extend the advantage of his discovery,

as it may be truly called, as widely as possible, he rented lands for the culture of potatoes, in the vicinity of Renfrew, Glasgow, Perth, Dundee, and Edinburgh.\* Such an instance of public spirit, and of successful enterprise, justly claims monumental record in the annals of agriculture.

Potatoes are now planted in this country by every farmer, in such quantities as to supply his family; and, in the neighbourhood of towns and villages, to supply the market. In the Carse, they are not, however, cultivated to any great extent: every farmer there, in general, plants in the tenderest part of his ground, or in land that had been summer fallowed, just what serves himself.—A loamy or arenaceous soil is the most favourable for potatoes. This soil abounds in the parishes of Kilsyth, Campsie, Strathblane, and in general in the western district of the county; and there potatoes are planted to a great extent.

Potatoes require to be richly manured with dung. In sandy soils, a mixture of one half dung, and one half moss or peat earth, is found to answer well.

Potatoes are seldom planted in lazy beds, except where new ground is to be brought under culture, or in some outskirts of a field to which the plough cannot reach. Cottagers and small possessors plant very generally by *dibbling*: they grudge the space which is lost by planting in drills; and in this case, hand-hoeing is always practised. But, when potatoes are cultivated

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\* See Statistical Account of Kilsyth.

to any extent, they are always planted by the plough, in drills, at the distance of about 80 inches, or three feet, and the sets at the distance of about nine inches in the drill. The dung is sometimes placed in the drill in which the sets are to be laid; but more generally spread upon the ground before the drills are formed. In the first case, the whole dung, no doubt, goes to the plant, and the crop is larger; but the potatoe is not esteemed so sweet or dry; and the benefit to be derived from the dung to the ensuing crop is lessened.

Potatoes are planted by sets, or cuttings, each having at least one eye or bud. About the year 1800, a small sharp instrument, of a spoon form, was introduced for scooping out the eye or bud only, and for saving the rest of the root, in those times of scarcity, for food. This instrument seems to have been soon abandoned; probably because the bud, accompanied only by a very small portion of the potatoe, was liable to be buried and lost in the operation of planting; and also, because it was found that a considerable portion of the substance of the root is necessary, at first, to nourish the young bud.

With regard to the different sorts of potatoes that are cultivated, they seem to vary beyond all possibility of calculation. Botanists will probably grant it to be the general character of plants whose fructification is, according to the Linnæan nomenclature, of the *Bacca* kind; (i. e. having a number of small seeds inclosed in a succulent substance, covered with a skin)—that their seeds, when sown, produce an endless variety of the plant. This is the character of the *ribes*, or gooseberry kind.

kind. It is also that of the potatoe, which, by sowing the seeds obtained from the apple or bulb, may be produced in every variety of colour and form. The seed sown produces, for the first year, only a very minute root, scarcely bigger than a pea: this being planted, produces, by the second year, a root of the size of a pigeon's egg: by the third year, it is of the ordinary size; and is an *early* potatoe, till, by long continued culture, it ceases to retain that character.—It is the business of the cultivator of this valuable root, to ascertain this process, and to follow it out by proper experiments.

In about a month after the potatoes are planted in drills, or as soon as the weeds begin to gain ground, the whole field is harrowed down level. In a short time, the shoots of the potatoe make their appearance, and mark the drills distinctly. Hand-hoeing is then applied; and when the shoots are sufficiently advanced, they are horse-hoed, three times, at least, in the course of the season.

It is of great importance to plant this root early, that it may ripen fully before the autumnal frosts destroy the tops: for the potatoe, being a green crop, derives much of its food from the atmospheric gases; and it is well known from the experience of autumn 1807, and of another year some time back, when the tops of the potatoes were destroyed by the frost, early in September, that from that moment they gained nothing. Potatoes should be in the ground, in this climate, by the 20th of April.



In this view, it seems to be a pernicious practice to cut off the tops of the potatoe, while yet green, as is done by some poor people for feeding their cows. Of the plan suggested in the last address of the President to the Board of Agriculture, of picking off the flower of the potatoe before it forms into an apple, the Reporter cannot speak with confidence, on account of the imperfection of the experiment made by him in Autumn 1808. He had the flowers completely picked off from a certain number of drills; but, during his absence for a considerable time, at that period, a new set of flowers succeeded, which were unfortunately allowed to remain. The drills which were treated in this way, however, appeared to be at least as productive, and even perhaps somewhat more so, than those which had been allowed to perfect the seed. It seems rational to conclude, that, if the vegetation of the plant is not injured by cutting off the flower, which does not seem to be the case, the root must receive the nourishment which would have gone to the apple, and be proportionally enlarged. The subject deserves attentive investigation.

It is singular that, in many potatoe fields which fell under the Reporter's observation, in Autumn 1809, particularly one of his own of five rods, the flower fell off almost universally without forming a bulb or apple. The crop was, at the same time, most abundant.

Potatoes are taken up, either by digging with an iron instrument, with three prongs, called a *grape*, or by ploughing down the drill, whilst a number of persons follow with *grapes*, to search for and gather the roots.

roofs. The latter is the most expeditious; the former the most economical method.

They are stored, for the most part, in heaps, of a longitudinal form, and terminating in a sharp ridge. These are covered first with straw, and then with a coat of earth, to the depth of, at least, 18 inches. The heap is besides generally roofed with thin turf. To store in pits, dug in a dry gravelly soil, with a course to carry off any water that may lodge, is not uncommon in this county. Potatoes are also sometimes stored in buildings; but, even in the closest buildings, it is proper that, in severe winters, they should be surrounded by a coat of straw.

The average quantity of potatoes planted on an acre is about three bolls; the average produce is from sixty to eighty bolls.

The *price* varies without end. In the scarce years of 1799 and 1800, potatoes sold at 16s. per boll, corn measure. In a year of plenty, they are sold for six or seven shillings per boll.

With regard to the *application* of this root, it also varies without any other limit than that of the species of animals that feed on it. It affords, both in its *boiled* and *unboiled* state, a nutritious food for horses, cows, whether giving milk or to be fattened, swine, and sheep. In its boiled state, it is used as food for poultry.

The potatoe produces a beautiful starch, which, when boiling water is poured on it, forms a jelly: if a little sugar is added, it furnishes a very palatable food. The quantity of starch, or farinaceous matter, produced by

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equal weights of different kinds of potatoes, is undoubtedly the just criterion of their respective value.

With regard to the keeping of potatoes by drying, the Reporter possesses no data from experience or information, to enable him to advance any thing. Considered *a priori*, drying expels a very large portion of the substance of the root; and it would seem that except in the case of preparing it for being conveyed by long voyages, for the use of navigators (and, in British economy, few uses to which it can be applied are more important), it may be easily and safely preserved from one end of the year to the other in heaps or in pits.

A potatoe crop is generally succeeded in this district with wheat, with barley, or with potatoe oats, accompanied with grass seeds.

#### SECT. XXIV. AND XXV.—CLOVER AND RAY-GRASS, OR RYE-GRASS.

As these two kinds of grass seeds are almost always sown together, it may be permitted to throw the account of them into one section.

Clover and rye-grass are sown with wheat, with barley, and sometimes, when the land is in good condition, with oats, particularly with potatoe oats. The

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red and white clover seeds are generally sown together, in the proportion of two of the former to one of the latter. For the most part eight lbs. of red and four lbs. of white clover are given to the acre. Sometimes a smaller quantity is given. In the Carse, where only one crop of grass is taken, white clover, whose great excellence is that it is a perennial plant, is seldom used: 12 lbs. of red are given to the acre.

With regard to the question, "Is the land tired of clover," the solution seems easy upon chemical principles. Mr. Kirwan, in a small tract "concerning the Principles of Vegetation," relates some experiments which he made in analyzing vegetables; and he found calcareous matter, in the *greatest* quantity, in wheat; in the *second* degree, in barley; and in the *third*, in clover grass: and he rationally concludes that these vegetables exhaust the calcareous matter with which the soil is impregnated, in the same order and degree. The celebrated discoverer, Mr. Davy, as quoted in a late Address to the Board, by the President, "found so much gypsum in the ashes of clover, that he conjectures that the failure of that plant may be caused by the gypsum being too much exhausted." It would seem, then, that though clover is a broad-leaved plant, it does not derive sufficient nourishment from the carbonic acid gas of the atmosphere; but requires also a supply of calcareous matter from the soil. The remedy is obvious: apply lime or gypsum, and you will have clover.

Rye-grass, being a narrow-leaved plant, and producing abundance of heavy seed, evidently exhausts the

soil. It is either annual or perennial. The annual is that which is now to be most commonly found in the shops, and cannot be distinguished by the eye from the other. On its first introduction, it was considered by agriculturists as an imposition, but is now, from various circumstances, gaining ground. In the carses of Stirlingshire, the land is too precious to be left in grass for more than one year. There the annual rye-grass is pretty universally preferred.

In the view of its exhausting quality, it would seem that it ought to supersede the perennial, even in the dryfields of the county, where, if the land is to be left in pasture, an abundance of native grasses, equally valuable and less exhausting, spring up on the second year, particularly the *holcus mollis* and *lanatus*.

If perennial rye-grass be allowed to run into seed whilst it is pastured, the cattle decline to eat it, and the ground is, at the same time, impoverished. The reporter remarked a very extensive field in the western district of Stirlingshire, one part of which had been sown with perennial rye-grass; but as a sufficient quantity of that kind could not be obtained, the remainder of the field was sown with the annual. This was the second year; and the field was pastured by sheep. That part which had been sown with perennial grass had run into seed, and not a single sheep was to be seen on it; that which had been sown with the annual, was covered with a fine sward of native grasses, and upon this the whole flock was collected.

There are, it must be allowed, some soils in this county, the carse soils especially, which if they are to be left  
in

in grass for a number of years; cannot cover themselves for a long period with native grasses. In these the perennial rye-grass is undoubtedly proper.

The hay is generally cut about the end of June or beginning of July. In the corses of Falkirk, Bothken-nar, &c. 300 stones are reckoned an ordinary crop. In the western districts, 200 and even 180 stones are reckoned a good crop. In the upper grounds of Strath-blane 100 stones are the ordinary crop; in the lower grounds 300 stones are not uncommon. From that parish alone, 10,000 stones of hay are annually sold, mostly in the Glasgow market.

A few weeks after the hay is taken off the ground, a second crop of clover alone springs up with great luxuriance. It is cut down, for the most part, for soiling, and furnishes an excellent food for milch cows and for horses. Sometimes that which remains till the frost begins to set in (by which this tender plant is soon destroyed,) is mixed up into a stack with early threshed straw. It heats or ferments, in a certain degree, and gives succulence to the straw, forming a very nutritious food for cattle.

This second crop of clover is often, as has been noticed, ploughed down for a wheat crop; and, from the circumstances that have been mentioned, furnishes an enriching manure to the ground.

Saintfoin, lucerne, chichory, and the other plants enumerated from Sect. xxvii. to Sect. xxxii. inclusive, are not known, or scarcely known, in the agriculture of Stirlingshire, though it might seem that some of them, particularly lucerne, might be introduced with great advantage in feeding cattle within doots. The soil, it is presumed, would, in general, answer.

There is a plant not enumerated in the plan of the Board, which is frequently sown with advantage in grounds laid down with grass. It is the *plantago lanceolata* of Linnaeus, or rib-grass. It is a native of the country, and the seed may be easily collected; it is sold in the shops. A small quantity is sufficient, perhaps one pound, for the acre. It affords a very succulent food for cattle. Its principal advantage is with respect to pasture. It continues long in the ground.

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#### SECT. XXXIII.—FLAX.

FLAX is not much cultivated in this county, though almost every farmer in the loamy and dryfield soils raises a little for the use of his own family. The seed is the highest priced of all that are used in husbandry; it is therefore of importance that the soil which is to receive it should be pared in the most complete style that is possible; a loamy, friable, and well pulverised soil

soil is, of all others, the most proper for this plant. It is of advantage to sow early; it is sown in March or the beginning of April. It is commonly weeded when about five or six inches high by women, who sit upon the ground, and advance as they weed, in this posture: This serves as a rolling to the plant, and fixes its roots in the soil. This evidently suggests the actual use of the roller.

In steeping it, the soft water of ponds or lakes is found to macerate the husk most quickly. The time of steeping varies a little with the temperature of the weather, as well as with the quality of the water. In warm weather, and in soft water, it is the common practice to give nine days and nine nights.

In the parish of Denny, seven pecks of flax seed are given to the acre, and the ordinary return is 20 stones. In the loams of Kilsyth, an acre produces from 15 to 20 stones of flax. In St Ninians, "12 pecks of lint-seed sown on an acre, after potatoes, return 36 stones of lint from the mill\*."

Flax is considered as a very exhausting crop, and is seldom or never repeated on the same spot without an interval of succeeding crops. † It is generally accompanied with grass seeds,

The plants enumerated in the succeeding sections of Chapter 7th are not cultivated in this county, except occasionally in gardens.

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CHAP.

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\* Stat. Acct. vol. 18. p. 390.

† Urit enim lini campum Seges.—VIRG.



## CHAP. VIII.

## GRASS LANDS.

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By this title it is understood that land held under regular culture, and occasionally laid down with the artificial grasses already spoken of, are excluded, and that an account is now to be given of those lands only which produce grass naturally, whether occupied as meadows or as pasture. Of both these kinds of land, there occur large tracks in Stirlingshire.

SECT.

## SECT. I.—MEADOWS.

THERE are many meadows in this county, of very considerable extent, some lying low on rivers, and others upon the higher grounds.

1. *Lying low on rivers.* The Carron bog, which is more than four square miles in extent, contains at least 3000 acres. In the parishes of Buchanan, Drymen, Fintry, &c. many hundred acres of meadow ground occur, on the banks of rivers, formed chiefly of alluvial earth. These meadows are often overflowed in winter, by the swelling of the mountain streams. The greater part of the Carron bog is flooded during that season by the river, which traverses its whole length, and which is there industriously carried over the plain. At that time, it presents the appearance of a large and beautiful lake. These land floods, by the deposition of earthy particles carried down from the hills, add greatly to the fertility of the soil; and are, at all times, beneficial, except when they occur near the period of cutting the hay: when they take place within a few weeks  
of

of that time, they pollute the grass, and too frequently render the crop altogether unfit for cattle.

These meadows are saved (or *hained* as it is called) from the middle of April, or beginning of May, till the period of cutting, which is from the 20th of July till the 15th of August, when the grass is supposed to have arrived at its full growth. It may be observed, at the same time, that in meadows liable to be flooded, and indeed in all situations, in this precarious climate, it is proper to take off the hay as early as possible; at the farthest, by the first of August. In favour of this practice, it may be further observed, that the grasses of which the hay of these meadows consist, when they are allowed to ripen fully, drop their seeds, which are so nutritious to cattle; and they become so hard and rancid, as to afford a much less succulent food than when cut whilst in full sap, and with the seed not quite ripe.

It may be proper here to attempt giving some idea of the various kinds of grasses which these bogs of natural meadows produce; and this, it is presumed, may be most successfully done, by an enumeration of the proportion which each kind occupies, at an average, in one hundred parts of such meadows. In such an estimate, perfect precision cannot be expected; all that can be done is to approximate.

Proportion of Grasses in 100 parts.

Carex—var. Spec.	35
Ranunculus acris	10

—  
Carry over 45

Carried over	45
<i>Plantago lanceolata</i>	10
<i>Aira cœspitosa</i>	5
<i>Holcus mollis et lanatus</i>	5
<i>Anthoxanthum odoratum</i>	9
<i>Caltha palustris</i>	9
<i>Juncus</i> —Var. spec.	5
<i>Scabiosa succisa</i>	5
<i>Ményanthe trifoliata</i>	2
<i>Eriophorum vaginatum</i>	3
<i>Tormentilla</i>	9
<i>Viola palustris</i>	2
<i>Hypochaeris radicata</i>	4
<i>Pedicularis palustris &amp; sylvatica</i>	5
<i>Lychnis flos-cuculi, angelica, valeriana,</i>	
<i>Spiraea ulmaria, Euphrasia, &amp;c.</i>	2

180

The cryptogamous plants, or mosses, the *polytrichum*, *hypnum*, &c. which abound in these meadows, are omitted in the above estimate, as contributing nothing, but rather doing injury, to the hay crops.

No manure is, at any time, given to these meadows. Their produce varies, according to different situations and circumstances, from 100 to 180 stones per acre; as does also the price of the hay, from four pence to nine pence per stone. It sells on the foot from 25 to 30 shillings per acre. The foggage, or pasture of these meadows, before the period of saving the grass, and after that of cutting, may be valued at 5s. per acre.

In making this hay there is more risk incurred, and more attention required, than in making hay of artificial grasses. In the latter, the fibre is large and strong; it easily admits the current of air, and long resists the effects of a rainy atmosphere. Meadow hay is soft in its fibre, and retains its succulence long; and can be dried for stacking only by a long and frequent exposure to the sun and wind. In rainy weather, which is so frequent in this climate, at that season, meadow hay frequently loses both its colour and its sap, so as to become unpalatable to cattle. Perhaps the most proper process in such weather would be, to put it up, from the very first, in very small coils, or cocks; and to embrace every favourable moment for turning these upside down; throwing, as circumstances will admit, two or three into one, and forming them with precision, so as to ward off the rain. By this method, the coils are ventilated, so as to prevent their heating; and the sap and colour of the hay is preserved.

2. *Upland meadows.* These may be distinguished into dryfield lands left in ley, after having produced crops of corn; and mountainous grounds, producing coarse grasses, which are sometimes cut for feeding outlying cattle in winter.

#### 1. Leys.

These grounds, when preserved for hay, produce a vast variety of native grasses, which furnish a winter's food for cattle, little inferior to that of the most highly valued artificial grasses. As many of these native vegetables which occur in Stirlingshire, from their valuable qualities, deserve to be known and cultivated; and, as  
it

it is hoped, will, one day, become serious objects of attention to Scottish agriculturists, it is presumed that a short detail of their character and qualities will not be deemed improper in this place.

1. The *lathyrus pratensis* abounds in the dry pastures and leys of the western parts of this county. It is a succulent herb, and very agreeable to cattle, either for field pasture, or when made into hay. It might be advantageously propagated by preserving its seed.

2. Several kinds of vetches grow naturally in these districts. The *vicia cracca* grows in dry leys, in such profusion as sometimes to constitute two-thirds of the herbage. It grows to a great height, from 20 to 36 inches in the field, and in hedges much higher. The Reporter, last summer, observed a ley field, in the upper part of Buchanan, almost entirely covered with this beautiful and succulent plant. It forms an excellent hay. It may be easily propagated from the seed; and might be sown advantageously, in a proper proportion, with lighter grasses.

The *vicia sepium* also grows abundantly in the same district; and seems to merit cultivation.

3 The *polygala vulgaris*, both white and blue, abounds in all these fields; it is very grateful to cattle.

4. The *ononis arvensis*, though upon the whole a noxious weed, is, whilst its leaves are young and tender, very agreeable to cattle.

5. White clover grows naturally, both in the low grounds, and in the hill pastures. It is a perennial; but the quantity of its growth should be increased, by  
sowing

sowing a certain proportion of it in every field that is to be left out in grass.

6. The *lotus corniculatus* grows, in considerable quantities, in dry pastures; and is highly grateful to cattle.

7. The *bellis perennis*, or common daisy, grows abundantly, and is greedily devoured by cattle.

8. The *tormentilla erecta* constitutes a great proportion of the herbage of dry pastures, and is greedily eaten by cattle. Its high degree of astringency is probably salutary in correcting the effects of other parts of their food.

9. The native grasses, the various species of the *aira*, the *poa*, the *festuca*, &c. form a large proportion of the herbage of these leys. But of all the grasses which grow naturally in this district, the two species of the *halcus*, the *lanatus* and *mollis*, will probably be allowed, on a fair estimate, to be the most valuable. In favourable situations, this plant has a broad and succulent leaf. The flower, or seed spike, is large and nutritious. The whole plant spreads, and forms a horizontal stool of sometimes 18 or 20 inches in diameter. It is peculiarly grateful to cattle. From the abundance of its seeds, and its disposition to multiply and spread by shoots, it seems to be peculiarly fitted for covering the ground expeditiously, after having been broken up by tillage. In the arenaceous and loamy soils of the western district of this county, it forms the great bulk of the grass crop which appears the second year, after a crop of annual rye grass had been taken off; and this second crop is often as heavy as the former. It propagates itself, though slowly, on carse grounds, newly recovered from moss, as the Reporter observed on the farm

farm of Mr George Galbraith, below the village of Kippen. Indeed, in carse grounds, it does not grow spontaneously in much plenty: to cover the ground, if that object is had in view, its seeds should be sown. In marshy soils, the *poa aquatica*, a strong plant, with heavy farinaceous seeds, and of which horses are particularly fond, may be propagated advantageously. It grows spontaneously in ditches which have not been cleansed for some time.

## II. Mountainous grounds, producing coarse grasses, which are sometimes made into hay.

In the Campsie and Fintry fells, the *juncus articulatus*, or spret, forms a great proportion of the herbage. On the very summit of the mountain, along the road from Campsie to Fintry, many hundred acres of this grass occur, without almost any mixture of other vegetables. It abounds also in some parts of Drymen parish. It grows to a great length. Cattle do not touch it in summer, if any other pasture is to be had. It is cut down in great quantities, in the end of harvest, dried, and stacked. It forms a hearty food through the winter for outlying cattle.

One great error that seems to be committed in preserving this grass is the lateness of the season when it is cut. By the month of September, when it is generally mowed, it has become coarse and hard; much of its seed has fallen off, and it must have become much less nutritious. Were it cut about the end of July, it would be much more tender and juicy, and a second growth would succeed, which, by the end of the year, would form



form a grateful pasture. A still more pernicious, but not uncommon error is, to leave this plant uncut altogether. It falls down to the ground, under the frosts of winter, and forms a thick matt, which is not only useless in itself, but obstructs vegetation for the ensuing season.

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#### SECT. II.—PASTURES.

1. *Rich feeding land.* Under this character fall to be noticed the lower division of the mountains of Killearn, Strathblane, Campsie, Kilsyth, St Ninian's, Fintry, Gargunnoch, and Alva, furnishing an extensive tract of feeding land, of a quality not surpassed by any in Scotland. These mountains are from 1000 to 1500 feet in height. The upper regions are occupied in sheep walks; they are separated from the lower, by a stone wall, loosely built, in the form of a Galloway dyke: and the lower part is besides subdivided into convenient fields, by fences of the same kind.

The native vegetables which are most abundant in these pastures are,

White clover.

*Plantago lanceolata*, or ribgrass.

*Senecio jacobea*.

*Gnaphalium dioicum*

*Centaurea scabiosa*

*Scabiosa*

*Scabiosa succisa.*

*Cerastium*—sparingly.

*Junci*, of various species abundant.

*Ranunculi*, do. do.

*Alchemilla vulgaris.*

*Galium montanum et verum.*

*Aira caespitosa.*

*Alopecurus, pratensis et agrestis.*

*Festuca ovina.*

*Holcus, lanatus et mollis.*

*Pteris aquilina, &c.*

These pastures are principally occupied in fattening black cattle for the butcher, and in rearing young stock, for which they are eminently adapted. In the Campsie hills alone, about 300 head of cattle are annually fattened, yielding from four to five stones, tron weight, of tallow. In Kilsyth about the same number are fattened : about the same number also in Strathblane. These cattle are, for the most part, from the west highlands, and of a small breed. They are fattened to the weight of from 18 to 24 stones tron.

2. *Dairy grounds.* In the rich carses of Stirlingshire, the dairy is little attended to : the richness of the soil renders it far more profitable to raise grain. In this district, every farmer keeps a few cows, merely for the supply of his own family. It is a singular thing, that the town of Stirling is principally supplied with butter by the moss lairds, as they are called, or cottagers of the adjacent moss of Blair-Drummond ; each of whom produces somewhat more than supplies his own family ; and the surplus is sent to the Stirling market ; Stir-

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ling is also supplied with eggs, chiefly from the same quarter.

In Gargunnoch, Kippen, Fintry, Strathbane, Campsie, and Kilsyth, and in the upper part of St. Ninians, the dairy is more attended to, but not to any considerable extent, as it has been found more profitable to rear cattle than to produce butter and cheese. In Strathblane, for example, where about 260 milch cows are kept, 130 calves are generally reared. The produce of the dairy must be, consequently, small.

According to the best information that the Reporter has been able to obtain, the annual value or produce of a milch cow, in Gargunnoch, including the price of her calf, varies from 4l. to 7l. The cheese which is made here is of inferior quality. In Kilsyth, the produce of a milch cow is estimated from 6l. to 10l. From this estimate made,—the former, on the northern side of this range of mountains, and the latter on the southern, some idea may be formed of the produce of the dairy in Stirlingshire.

At the same time, it seems proper to cite some remarks on the dairies of Stirlingshire, made near 14 years ago, by Mr Belsches of Greenyards, in his Report of 1796; premising only, that it appears that the dairy was much more attended to in this county, at that period, than it now is.

“ Few calves,” says he, “ are reared, being mostly  
“ sold to the butcher. The milk is manufactured into  
“ butter and cheese. Much improvement is wanted in  
“ the making of cheese. The curd is not sufficiently  
“ prepared: too little salt is mixed with it; and proper  
“ presses are not in general use. Butter, in great quantities,  
“ tities,

"tates, is also made in the dairy, during the summer,  
"and beginning of autumn. It is generally sold fresh,  
"to Glasgow, Stirling, and Falkirk markets. In au-  
"tumn, the butter is generally salted up in wooden or  
"earthen vessels, and sent to Edinburgh, Glasgow,  
"and other markets. Both the plunge and barrel  
"churns are used; but in general the plunge churn is  
"preferred. The whole operation of churning is per-  
"formed by manual labour; and, almost universally,  
"the cream alone is employed in making butter. What  
"of the butter milk is not consumed in the family of  
"the farmer, is either sold to labourers and manufac-  
"turers in the neighbourhood, or sent in small barrels  
"to market. A few gentlemen give the butter milk  
"and whey to the hogs.—In the management of the  
"dairy, the cows are milked three times a day, in the  
"height of the season. At present, the cleanliest dairy  
"women are bringing earthen vessels into use; and in  
"some places, wooden vessels, lined with lead, are em-  
"ployed for holding milk.—Cows are commonly al-  
"lowed to pasture in the mornings and evenings, and  
"through the whole night. They are kept in the  
"house, and fed in the middle of the day, in the hot  
"season of the year, which preserves them from being  
"tormented by insects." Mr B. adds, that "the annual  
"produce of a good cow is supposed (1796) to rise  
"from 5l. to 12l.: that the larger kinds are universally  
"disused on account of the superior quantity and qua-  
"lity of the food which they require, and of the wet-  
"ness of the climate, which occasions the land to be  
"much poached by the tread of such heavy cattle: the

"summer food of a cow," says he, "is often bargained for at a price from 30s. to three guineas."

The summer's grass of a cow lets, at present, in these pastures from 2l. to 3l.;—another proof that dairy farming is not carried on upon an increased scale in this district. The walk of a cow in winter, without fodder, 1l.

3. *Sheep pastures.*—A great proportion of the superficial extent of this county is occupied in pasturing sheep; the mountains of Buchanan and Drymen almost exclusively; together with the upper region of that whole range of mountains which stretches from Killearn, through the parishes of Strathblane, Campsie, Kilsyth, Fintry, St Ninian's and Gargunnoch, and the hills of Alva.—In these latter, the herbage is fine, and consists nearly of the same plants that occupy the lower part of the mountain. In the mountains of Buchanan and Drymen there is much heath, which, however, is rapidly disappearing, in consequence of spring burning, and the bite of sheep: for it is remarked, over all the highlands, that, wherever sheep have been long introduced, the heath gradually dies away, and is succeeded by rich herbage, to which, no doubt, the droppings of these animals contribute in no small degree.

Benlomond is esteemed the richest sheep pasture in the western district of the county. There occurs no heath on this noble mountain after you have ascended about one fourth of its height; and, even in the lower region, it occurs partially and scantily. The whole mountain is covered with verdure; and furnishes to the botanist one of the finest fields of study to be found in the highlands of Scotland. The Alpine plants of the  
rarest

rarest kind abound: the *rubus chamaemorus*; the various kinds of *saxifrages*; *alchemilla alpina*, *cerastium alpinum*, *silene acaulis*, *azalea procumbens*, *rhodiola rosea* and *trientalis europea*, adorn its sides; and the *sibbaldia procumbens* gives perpetual verdure to its very summit.

In the portions of these mountainous pastures which are not occupied by heath, various grasses very grateful to sheep abound, as the *carex*, of different species, *junci*, *festuca ovina*, &c. Where a mossy soil occurs, it is, for the most part, infested with the *anthericum ossifragum*, and the *drosera rotundifolia*, both accounted hurtful to cattle, and apparently with justice. Indeed they are seldom touched by them.

Of the rent of sheep pastures, in different parts of the county, some idea has been offered in chap. IV.

4. *Laying land to grass.* This article is understood to refer to lands which had been occupied in tillage, and which, after being exhausted by cropping, are to be restored to fertility, by being laid down to grass, and rested.

In the rich corses of Stirlingshire, the ground is too valuable to be allowed to remain long under grass; nor does this process there seem necessary. It will be seen by the table of the rotation of crops which has been given, that lands are generally laid down to grass with a barley crop, with wheat, with potatoe-oats, and with flax. The grass seeds generally used have been mentioned. They are sown in the end of April, or beginning of May. In the corses, one crop of hay is taken; the second growth is used for soiling. In the dryfields, one crop is, in like manner, taken; and the land is pastured for two years.

It is of importance to observe, that either dung or lime, or a portion of each, is, or ought always to be added to lands laid down in grass. Without this addition, the soil will be little benefited by *resting* in grass. These manures are necessary to furnish an alkaline base, by which the natural acids that float in the atmosphere may be attracted, and those neutral salts formed, which are so conducive to vegetation.\*

5. *Breaking up grass land.*—With respect to *paying* and *burning*, it may be observed, that they are operations of a very costly nature, and to be employed with much caution. In this process, it is calculated that no less than 19 parts out of 20 of matter fit for promoting vegetation are dissipated and lost, whilst the saline substances procured by the operation are so inconsiderable in their quantity as to be no object to the cultivator.

It is not the practice in this county to let grass land, for a short period, with *permission* to break up; though it has in a few instances occurred. The rent, in such instances, varies from 4l. to 6l. There are said to have been instances in Dunbartonshire, on the western confines of this county, about the year 1800, of lands having been let for breaking up at 14l. and even at 16l. per acre.

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\* See p. 136, & seq.

## CHAPTER IX.

## GARDENS AND ORCHARDS.

## SECT. I.—GARDENS.

IN Stirlingshire, the gardens of gentlemen of fortune are made to produce every vegetable luxury that is to be met with in the southern parts of the kingdom. The climate, as has been already noticed, is, from the narrowness of this part of the island, extremely mild;—and, in this view alone, of indicating the climate, does it now seem necessary to say, that peaches and apricots ripen, not unfrequently, upon the open wall. Apples, pears, cherries, plumbs, and all sorts of small fruit, thrive well. In the very western extremity of the county, grapes, peaches, nectarines, and pine apples are produced under glass, in the greatest abundance and perfection.



Still, however, the peasantry, especially those of the inferior order, are deplorably inattentive to the comforts of garden produce. They cannot be made to comprehend the assistance that may be derived from a kitchen garden to the subsistence of a family. The cultivation of carrots, turnips, pease and beans, onions and leeks, is very rare amongst them; or at least it is attended to upon a very limited scale, except in the neighbourhood of towns, where a ready sale furnishes a spur to industry.

#### SECT. II.—ORCHARDS.

ORCHARDS are still less attended to in this county than kitchen gardens, though there is perhaps no county in Scotland better adapted to the production of fruit. In Clydesdale, probably from accidental circumstances at first, and, at present, from the ready market for fruit afforded by the great city of Glasgow, orchards hold a distinguished place in agriculture.

In Stirlingshire, it would seem that the very contrary process has obtained.—It is well ascertained that, in ancient times, orchards were cultivated, on an extensive scale, in the carse of Bothkennar and Airth. The greatest part of this fertile territory belonged to the abbey of Cambuskenneth, by the gift of David I.—The monks,

monks, slight as were their scientific acquirements, when compared with those of modern times, possessed all the knowledge of the age; and, in their choice of situation for their religious establishments, with respect to shelter, fertility of soil, and even picturesque beauty, we must still admire their judgment and taste. The Abbey of Cambuskenneth, situated upon one of the beautiful links (curves) of the Forth, N. E. of Stirling, and still within the bounds of that parish, furnishes an example.

The dignitaries of the abbacy had country seats on their estates in the adjacent territory on the southern side of the river. There, horticulture appears particularly to have engaged their attention, at a period when we have no reason to believe that the most powerful of the nobles of Scotland possessed the luxury of a kitchen garden. Whilst the monks of Cambuskenneth had orchards in the rich plains of Bothkennar, which produced the pears and rennets of France, Sir John the Graham, the friend and coadjutor of Wallace, inhabited a castle situated on the skirts of a bleak moor, in the western extremity of St Ninian's, where probably there was not a gooseberry or cabbage ever raised.

These luxurious clergymen passed the winter in the Abbey, whilst they spent the summer in Airth and Bothkennar, where the reliques of these orchards may still be traced. The soil, as has been said already, is a clay of very great depth. To prevent the roots from shooting down perpendicularly into the cold soil, to which the influence of the solar heat never reaches, and to direct the roots to seek their food in a horizontal direction, they placed large flags under every fruit

fruit tree. These flags are still found in all their orchards.

Indeed, no soil seems to be more favourable for fruit trees than the Carse of Stirlingshire. In the parish of Bothkennar there are *twelve* orchards; and in that of Airth, *nine*, many of which were planted by the monks. The pear tree particularly thrives in this soil. The *golden knap*, or *gouden nap*, as it is here called, seems peculiar to this part of Scotland. This tree bears astonishing crops. The produce of many single trees of this kind has been known to sell for ten guineas. It is equal in beauty to any fruit tree whatever: it is never known to canker.

Orchards in the Carse may be estimated to bring from 50*l.* to 100*l.* per acre. Upon the estate of Westertown, in Bothkennar, a small orchard, of about an acre, about twelve years ago, produced almost nothing, the trees being very old, and much decayed. The present tenant thought of recruiting them, in which he succeeded, by laying over the surface a rich covering of dung in the beginning of winter, so as to give an opportunity to the juices to penetrate to the roots of the trees. The next year he laid on a covering of quicklime, hot from the kiln. The trees became immediately healthy. Though large, and very old, they took on a new growth; and have ever since produced large quantities of fruit. One year, he sold the produce of this orchard for 100*l.* In less favourable years, he has sold it for 69*l.* and for 43*l.* In the year 1809, though unfavourable for fruit, it brought 60*l.* Since the first dressing, he occasionally gives dung to this orchard; which, without taking the fruit into account, is amply repaid

repaid by the large quantities of early grass that it produces.

Were the trees planted in rows in these orchards, abundant crops of potatoes, turnips, or flax, might, without any injury to them, be raised in the interstices.

It is to be regretted that orchards are not more generally cultivated in this district. The cause of this neglect is not far to seek. An orchard makes no return for ten or twelve years after it is planted, which, in almost every instance, exhausts two-thirds of the period of the lease; and most people prefer a lesser present advantage to a greater one at a distance. From the same cause, orchards are much neglected by tenants. When a tree is blown down, they do not think of planting another. To keep the orchard in a good condition, and especially to improve it, would, at the renewal of the lease, be to raise the rent on their own heads. Some scheme of remedying this evil would be of great advantage in the Carse.

When orchards are to be planted in these soils, the ground should previously receive a complete summer fallow. A trench or ditch should be drawn round it, of eight feet wide at top, and five or six feet deep; and all the earth which is taken from it spread upon the space that is to be planted. In the Carse, this ditch is absolutely necessary to carry off the superfluous moisture; as the roots of the trees, when soaked in water, soon decay. If the trees are planted in autumn, the roots should be covered with straw, to defend them from the frost. The practice of the monks of Cambuskenneth, too, should be followed, of placing a flag stone of a  
foot

foot or 15 inches in breadth, under every tree, to give the tap root a horizontal direction; which, when it has once taken, it will always preserve; finding the nourishment to be obtained near the surface more genial, as well as more accessible, than that which it would receive by pushing downwards. Double the number of trees should be planted at first of what is intended to remain, in order to give shelter, and, in due time, to have a proper selection. The ground in the interstices should be kept in culture for the first 15 or 16 years, in order to kill noxious weeds. An orchard, in this climate, should be sheltered by a belt of trees, on the north, and east, and west, leaving the south open to the influence of the sun. The one half of these trees should be evergreens, to afford shelter before the deciduous trees come into full foliage.

By such attention, favoured with such a climate and soil, the Carse of Stirlingshire might become the fruit granary of Scotland; the grateful beverages of perry and cyder might be produced at home; and the consumption of foreign wines in a great measure superseded.

In this view, and speaking of fruit trees, gooseberries and currants deserve attention. They thrive admirably in this climate. Besides the preserves that may be made from them, the wines which may be manufactured from them form a cheap and delightful beverage; which, it may be hoped, will, one day or other, save to the nation many thousands which now go to the wealth of France and Portugal.

Before we quit this branch of the subject, it may be proper to notice, that in the old orchard at Duchray Castle,  
in

in the parish of Drymen, there are some aged filbert trees, a variety of the *corylus avellana* of Linnaeus, which produce a nut of larger size and higher flavour than the common nut of the woods. These were brought originally from the monastery of Inchmahoma, in the isle of Menteith, where the filbert is still cultivated to a considerable extent. It is the *avellana rubra* of Bauhin (pin. 418.), and thus described by him: "var.  $\gamma$  *corylus sativa fructu oblongo rubente*."

The filbert is generally propagated by layers, as being greatly preferable to budding or engrafting; though it takes very well by engrafting on the common hazle; but it is too apt to throw out suckers or shoots under the graft, to make a good stock.

Aiton, in his *Hortus Kewensis*, and Professor Martyn, in his late edition of *Miller's Dictionary*, agree in the opinion that all the filberts are only seminal varieties of the *corylus avellana*, or common nut.

## CHAPTER X.

### WOODS AND PLANTATIONS.

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THE woods and plantations of Stirlingshire constitute a very important part of its wealth: and the possibility and probability of rendering these far more productive than they have hitherto been, give a high interest to this part of the subject of our Report.

Many appearances still exist which render it unquestionable that a great proportion of this county, as well as of all the western parts of Scotland, was formerly clothed with wood. The mosses of Kippen, Gargunock, and Airth, in the lower district of the county, and the still more extensive mosses of Polmont, Muiravonside, Slamannan, Fintry, St Ninians, Drymen, Buchanan,

chanan, &c. of higher elevation, bear evident marks of ligneous origin.

That the whole of that elevated range of country, extending in a semicircular sweep from Stirling to the neighbourhood of Polmont, was, at one period, covered with wood, appears more than probable, even from its present aspect. The Torwood and Callander wood, in the neighbourhood of Falkirk, are the evident remains of this very extensive forest. "The royal forest of Dundaff must have covered the highlands, which are still called the lands of Dundaff. The royal forest of Stirling must have covered the rising grounds to the south of that town. An extensive moss renders it probable, that even the low lands of the parish of St Ninians, especially to the north-east, were once covered with trees."\* Even to the westward of Stirling, the reliques of this same range of forest may be traced. Dr Robertson records,† that "in many places of the muir of Gargunnock, there are roots of trees discovered, of a large size, from which it appears to have been once a forest; but that now not a tree can be discerned."

To root out, and to remove these woods, so as to fit the ground for pasture, or for the plough, seems to have been, as it now is in America and in South Wales, the policy of our forefathers. The Scottish forests, as we have reason to believe from history, as well as from tradition, were then infested with bears, and wild boars, and wolves;

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\* Statistical Account of Scotland, Vol. XVIII. p. 387.

† Ibid. p. 94.



wolves :—they were useless for the purposes of agriculture. Besides the demolition of the Caledonian forest, of which Xiphilinus speaks, and which certainly was situated in this district, there is reason to believe that the natives, from economical views, joined, in after ages, in stripping the country of its wood.

The circumstance of the introduction and multiplication of cattle, which, at an early period, became favourite objects in the north of Scotland, will go far to account for the extermination of our forests. When wood remains unprotected from the bite of cattle, it will soon disappear. The aged trees which are beyond their reach, decay with the lapse of years. The young shoots which arise from the seeds which they had disseminated, or which had sprung from their roots, are nipt in the bud, and never become trees. In the bite of cattle, there is a peculiar malignancy to the growth of wood: the irregularity of the incision poisons the plant, to the growth of which the smooth cut of the knife would have only given an obliquity of direction.

Scarcely half a century has elapsed since the value of wood, and particularly of oak coppice, has begun to be justly appreciated in this district of Scotland. From that period, however, the policy of our ancestors, in this respect, has been happily reversed. To protect natural woods from every kind of depredation; to extend their limits by obvious processes; and to plant trees of every kind that is useful or ornamental, is the present practice of every enlightened landholder.

The

The woods of Stirlingshire may be conveniently distinguished into those which grow *naturally*, and those which have been *planted* by the hand of man.

I. *Natural Woods.*

These are generally termed coppice; and consist of the various species of timber which grow naturally in Scotland. It will not, it is trusted, be deemed improper to enumerate the native constituents of these woods, according to their scientific denominations. They are these :

<i>Quercus robur</i>	-	the oak.
<i>Fraxinus excelsior</i>	-	the ash.
<i>Salices variae</i>	-	willows of different species.
<i>Acer pseudoplatanus</i>	-	the greater sycamore, or maple, probably not a native.
<i>Populus tremula</i>	-	the quaking ash, frequent.
<i>Corylus avellana</i>	-	the hazle tree, frequent.
		See p. 177.
<i>Betula alba</i>	-	the common birch, abundant.
<i>Betula alnus</i>	-	the alder tree, abundant.
<i>Ilex aquifolium</i>	-	the holly, not infrequent.

The *pinus sylvestris*, or scots fir, is a native of other parts of Scotland, but not of Stirlingshire. The *carpinus betulus*, or hornbeam, with the *fagus sylvatica*, or beech, are stated by Lightfoot to be natives of Scotland; the latter is particularly stated by some writers to be a native of the Torwood in this county; but there

is reason to believe that they are both exotics. Beeches of a large size are to be met with in Stirlingshire, particularly in the lawn about Callander house; but it is certain that these have been planted.

The *taxus baccata*, or yew tree, is unquestionably a native of Scotland, and formerly abounded in Stirlingshire, as the names of many places, such as *Skia n' iuir* (the ridge of yew trees), and *Falisc-iuir* (the conflagration of yew trees), still attest. It has now disappeared in this, as well as in many other places of Scotland, having been extirpated probably on account of its deleterious effects when eaten by cattle.

The *sorbus aucuparia*, or mountain-ash, vulgarly called the rowan; a beautiful tree in respect of foliage, flowers, and fruit, and capable of being applied usefully, both with regard to its wood and bark, grows in great abundance.

The *crataegus oxyacantha*, or hawthorn, grows to a large size in our glens and rocks; and, with its hemispherical top, forms a beautiful addition to the shrubbery.

The *pyrus malus*, or crab-apple, abounds in the woods in the highland district; it makes a fine figure when in full flower.

The *prunus padus*, or birds' cherry, sometimes grows in these woods to be a specious tree. Its fruit, when ripe, is black, resembling the gean. It is deleterious in a considerable degree.

*Oak*

*Oak Woods of Stirlingshire.*

The oak woods of this county constitute such a considerable part of its wealth as to merit, on this occasion, a particular detail, in regard to their extent, value, and management.

1. According to the most accurate information that has been obtained, the extent of the natural oak growing in Stirlingshire is as follows;

	Acres.	
Buchanan woods	- 1800	} The property of his Grace the Duke of Montrose.
Mugdock wood	- 163	
Ledlewan	- 70	
Finnich Drummond	- 30	
Duchray woods	- 100	Of Gen. Graham, Stirling.
Patches of oak in Killearn, Strathblane, Campsie, and Kilsyth	- 200	
Woods in Kippen parish	50	
Boquhan, in Gargunnoch parish	- 43	
Torwood	- 63	
Touch woods	- 80	
Natural wood on the Cal- lander estate	- 300	William Forbes, Esq.
Small patches in the east end of Drymen parish	30	

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Total acres 2929

Thus it appears that there are in this county near  
3000 acres of oak coppice wood, exclusive of many  
O 2 hundred

hundred acres of ash, birch, alder, &c. constituting a very valuable species of property; growing, for the most part, on a soil which would not, for any other agricultural purpose, bring half a crown an acre; and requiring, at all times, very inconsiderable trouble and expence in management.

2. The value of these woods may be calculated *nearly* from the following data. An acre of ground, in the Buchanan woods, by an average reckoning over their whole extent, produces one ton\* and a half of bark. In some favourable soils and situations an acre will produce twice that quantity; but the above may be considered as the medium. A ton of bark sold in 1809 at 18l. Sterling.

The small timber of these woods is, for the most part, sold for the purposes of rural economy; and the price is generally supposed to indemnify the wood merchant for the expences of *cutting* and *peeling*; though, from the advantage of water-carriage by Lochlomond and the Leven, it is presumed that the Buchanan woods must do a good deal more. Of this timber are also made hoops, treads and spokes for carts, and rafters for palings to a considerable extent. The refuse is sold by roup for firewood.

Oak wood is seldom or never used in making charcoal. Birch, which abounds in the western district of the county, is principally used for this purpose, being of little value for any other. Alder too, and hazle, and willow,

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\* Ten stones Dutch weight of oak bark make one boll: Twelve bolls and eight stones, or 128 stones, make one ton.

willow, which also abound, may be converted into charcoal:

As to *grubbing* up coppice wood, it may be observed that, in the western part of the county, wood, especially oak, is too valuable, and the soil on which it grows of too little value for any other purpose, to be grubbed up: a few instances may be excepted, where only alder and willows grow. The only instance of any importance that fell under the Reporter's notice occurred in the Lower Torwood, where this operation costs from 15*l.* to 20*l.* per acre; but when the land is thus cleared, it is as valuable as any in Stirlingshire.

### 3. *Management of Oak Woods.*

As His Grace the Duke of Montrose is by far the greatest wood-holder in this county, and (possessing a nearly equal extent of oak wood in Perthshire) probably the greatest proprietor of oak in Scotland; so the management of these woods over all his estates, for these last twenty two years, under the intelligent direction of George Menzies, Esq. his Grace's chamberlain, furnishes the most complete model in this respect that is any where to be met with. To that gentleman the Reporter is principally indebted for the following, and for many of the preceding particulars.

The whole extent of the Buchanan woods is divided into 24 portions, called *hags*; one of which is annually sold by public auction, and cut down. In this manner, the whole is cut down in the course of 24 years; and when the last *hag* at one extremity is taken down, the first, at the other, is ready to be cut the ensuing year.

These *hags* vary considerably in their extent and value, from local and accidental circumstances of situation and soil. These circumstances are attended to in their arrangement. In general, they extend from 70 to 100 acres. Within these few years, the price of one of these hags has varied from 1200*l.* to 2400*l.*

The purchasers of these woods begin the operation of cutting *as soon as the bark will rise*, that is, as soon as the vegetable juices ascend under the bark, so as to render it easy to disengage it from the wood. They are bound by their contract to finish their cutting by the 10th day of July, under the penalty of forfeiting all that is left standing. This stipulation is necessary, in order that the young shoots may have time to make some progress before the rigors of winter set in. They oblige themselves, besides, to cut the stems as close to the ground as possible, the ensuing growth having a much firmer hold, and finding more abundant nourishment, the more closely its roots adhere to the ground. They are further bound to leave as much of the small wood as will enclose the whole *hag* with a paling of strong stakes, wrought close with *peeled* crops, here called *rice*, sufficient to last for full six years.

The occupier of the farm on which the wood that is to be cut is situated, is bound by his lease to erect this paling at a certain rate by the rood of 36 linear yards. This is done immediately after the wood is cut; and he is *then* bound to maintain it, during the lapse of the six years (if his lease endures so long) in a condition to prevent the encroachments of all kinds of cattle, under a suitable penalty for every instance of transgression.

Till

Till within these twenty years, the Duke of Mon-trose's woods were weeded, or thinned, only once, and that at the age of 12 years. There is nothing more obvious than that the abstraction of nourishment from the stems that are to remain, as well as the want of a free circulation of air, from the closeness of the stems, during so long a period, must prove highly injurious to the growth of the wood. For these twenty years, however, the Duke's woods have been regularly weeded, or thinned, for the *first* time, at the age of six years. And Mr. Menzies obligingly informs the Reporter, that, as a still further improvement of this system, " he has begun this year (1810) to thin the woods at the age of "four years; and that he intends to thin them even "at that of *three*." There can be no doubt that the operation will be crowned with success. The stems that are left will be beyond the reach of cattle in less than six years; when, it must be evident that, notwithstanding the utmost attention of the tenant, the paling must have become very frail.

For many years past, under this judicious management, there is also a *third* weeding given with the best effect: it takes place at the age of twelve or fourteen years. In this weeding, five or six stems, as circumstances admit, are left to every stool of oak. The *two* first weedings are given in winter, when cottagers, who, at that season, have nothing else to do, are glad to obtain employment. The *third* takes place in summer, when the bark rises freely. The stems that are left are, at the same time, pruned into proper form, no evil consequence arising, as the oak never bleeds. The bark produced by this *third* weeding pays considerably



more than its own expence, and that of the two former weedings: and the rapid growth which ensues from the encreased nourishment, and from the free circulation of air, is highly striking.

In every hag, previously to the sale, between three and four hundred trees of the most specious form are marked and reserved for timber. Some of these have stood for two cuttings, some for three, and some for four; and are, consequently, forty-eight, seventy-two, or ninety-six years old. In the wood of Salachy, in Buchanan, there are some trees eight, and some ten feet in circumference, at one foot from the ground, and from five to seven feet in circumference at ten feet from the ground: they are from thirty to forty feet in the stem.

In former times, the reserves were chosen chiefly from seedlings, or trees standing single, and supposed to be produced from an acorn that had been dropped. This attention, however, is not, at present, found to be necessary. Reserves that may, in the space of fifty or sixty years, become timber fit for the navy, are procured, with still more certain effect, by selecting one of the straightest stems that occur in a stool of oak, and by razing the inferior stems by the ground. The reserve soon gains the ascendancy, and its droppings effectually prevent the growth of the rest. It is even observed that such reserves prove to be straighter and more beautiful trees than those which spring from the acorn, which are often crooked and straggling, and seldom acquire a proper form till they are cut over with the knife.

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By this simple method, it is obvious that oak timber of very considerable size, and fit for every domestic and national use, may, in the course of half a century, be obtained from our own woods, in a degree of abundance which exceeds calculation. It may be permitted to remark that, in the present situation of our country with regard to foreign nations, this seems to be an object of imperative attention; and that there can scarcely be a louder call on patriotism than to employ this easy method of increasing the number of reserves in every coppice wood in Britain. The final pecuniary return, it is presumed, would be even greatly increased.

Along the lower skirts of the mountains of Buchanan, and on the borders of Lochlomond, as well as on the Duke of Montrose's estate in Perthshire, there is a strong natural tendency to the extension of the growth of oak. On almost every little heathy knoll, you meet with stunted stools of oak, which require only to be razed over by the surface of the ground, and preserved from the bite of cattle, to become coppice wood. To this extension of the woods, accordingly, every attention is paid. When a hag is cut, the paling is made to surround every bit of ground where it is likely that oak will grow; and in the leases liberty to do so is always reserved. In this manner, oak is rapidly extending over Craigrostan, the western shoulder of Benlomond, and in many other places of the estate, where, within these few years, heath only grew.—When the value of this soil, which is frequently bare rock, and, in almost every instance, at least in the western parts of the county, unfit for bearing a corn crop, is considered, it would seem that no economy can be more advantageous

vantageous than the enlargement of these coppices by extended enclosure.—A mode of enlarging oak coppice upon an unlimited scale, which has been practised for many years upon the Duke's estate, will be detailed under the section of *Plantations*.

It appears to be a fact established by experience, that oak coppice wood will not renew itself if it remains uncut beyond the period of 35 or 40 years. The general period of cutting is 24 years. An instance of the total and perpetual loss of an extensive and valuable wood on the Duke of Montrose's estate is in point, and seems to merit the attention of wood-holders. It is in the memory of persons still alive, that about sixty years ago, the thriving wood of Glaschoil, stretching along the southern banks of Loch Katrine in Perthshire, was sold to the York-building company, which, however, became bankrupt before the wood was cut. During the unsettled state of the company's affairs, the wood was left standing, his Grace's commissioners not considering themselves entitled to interfere with a property which had been sold; nor could the creditors of the company interfere, their claims not being yet legally established. At length the wood was cut down at the age of about forty years. It has never renewed itself, and now scarce a trace of it remains.

## SECT. II.—PLANTATIONS.

It is only within these forty years that the extension of woods by planting has been attended to in this country on a considerable scale. There occur, indeed, some insulated instances of planting trees in the neighbourhood of the houses of great proprietors some centuries back, and these are consequently arrived now to a large size. They will come properly to be noticed under the following section, of timber.

For some years past the landed proprietors of Stirlingshire have become duly sensible of the advantages of plantations, in respect of embellishment, of shelter, and of profit.—Many hundreds of acres have been clothed, within these few years, with waving forests, which before presented only barren heaths, or unproductive pastures. On the estate of Boquhan, in Gargunnoch parish, near 400 acres have been planted. On the estate of Sauchie, an extensive plantation of oak, ash, beech, and the various species of the pine, furnish a fostering shelter from the sweeping violence of the south-west wind. The example of Sir Charles Edmonstone of Duntreath, Bart. is, in this, as well as in many other instances of rural economy, highly conspicuous. Mr Archibald Edmonstone of Strathblane parish, amongst many other valuable communications, writes that “in the years 1807, 1808, and 1809, Sir Charles  
“ has

"has planted on the Duntreath estate upwards of 200,000 trees of various kinds, but chiefly *hard wood*," that is, oak and ash.

The most extensive and persevering example, however, of modern plantation in this county, is furnished by his Grace the Duke of Montrose, who, for these twenty years, has planted, at an average, sixty acres annually, and is rapidly covering the skirts of the mountains of Buchanan, formerly a bleak heath, with a thriving wood. As the manner in which these plantations are conducted seems to furnish a model in this respect, the detail, it is presumed, will be acceptable.

The species of trees that are planted are, oak, ash, sycamore, (*acer pseudo-platanus*) beech, larch, and Scots firs.

The oaks only are reared in the nursery at Buchanan; the acorns are procured from England, and sown in rows in the month of March. They are generally allowed to remain in the seed bed for two years, when they are removed into the nursery, where they remain for four years. Being then about five feet high, they are planted out; if they are too high, so as to be liable to injury from the winds, they are cut over at top.

The other species of trees are procured principally from Glasgow.

The leading feature, however, in the conduct of the Buchanan plantations is, that they are chiefly directed to the extension of oak coppice-wood or ash, over those parts of the estate which are not included within the pleasure grounds. In these last every species of tree is introduced which contributes to ornament; whilst,

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in the more distant plantations, the grand object is to clothe the country with oak or ash.

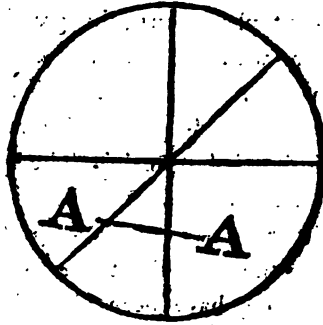
With this view, Scots fir and larch are employed only as nurses; when this purpose is served, they are cut down, and oak chiefly remains. The eye can judge when the oaks have arrived at sufficient growth and strength to resist the blasts, and to support themselves. This is generally the case about the fifteenth or sixteenth year after they have been planted. After that period, they are treated, with regard to thinning and pruning, precisely as oak coppice wood is. When they are of a proper growth, they are, in the same manner, cut down, and will, in the same manner, renew themselves for ever.—The Scots firs and larches, which had served as nurses, are applicable to many purposes of rural economy.

In this process, 1000 oaks or ashes are planted in an acre, and about 1200 Scots firs, with about 400 larches, as nurses.

The plants are not put into the ground by *pitting* as is the general practice elsewhere. Besides that the operation of pitting is tedious, and consequently expensive, it is found, that in wet weather the pits fill with water; and that, in dry weather, the moisture is apt to be exhausted; in each of which cases, the tender roots of the plant suffer injury.

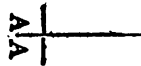
The method here practised is as follows: the operator, with his spade, forms a circle of about twelve or fifteen inches diameter, and cutting a few inches deep. He then makes three cuts with his spade within the circle, crossing each other, as diameters, through the centre; the whole having the annexed form:

He



He next inserts his spade in the direction of the line A A, at the distance of a few inches from the centre; and bending the handle of the spade towards himself, and almost to the ground, he gently elevates the contents of the circle, the earth opening in fissures, in the direction of the cuts which had been made through the centre. At the same instant, he inserts his plant at the line A A, pushing it forward to the centre, and assisting its roots to ramble in the various fissures; he lets down the earth by removing his spade, and having pressed it into a compact state with his foot, the operation is finished by adding a thin covering of earth, with the grassy side down, by way of a top-dressing.

This is the method employed in planting oaks. That used in planting Scots firs and larches is still more simple; a single cut of sufficient depth is made with the spade, and then the earth is elevated, as before, by a cross cut A A, into which the plant is inserted, and gently pushed forward, till its roots obtain full admission into the soil.



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By this method, an experienced man will plant 500 oaks in a day, or between 6 and 700 larches and Scots firs. Such a man will plant a whole acre, with the proportions which have been mentioned of the various species of trees, in five days; and it is estimated that such an expert person will do as much in fifteen days as twenty ordinary men will do in one day. The expence of labour in planting an acre, exclusive of enclosing and draining, may be calculated by stating that the usual wages of such a person are half a crown a day.

When it is necessary to drain the ground before it is planted, the earth taken from the drains is used in giving the top-dressing which has been mentioned. The operation costs from 10 to 30s. per acre. In dry moorish soils, where plants would not otherwise thrive, the ground is thrown up into lazy beds, and the stuff taken from the intervals is spread on the surface.

There is one other method of extending plantations, practised on the Duke of Montrose's estate, which merits the attention of all proprietors of coppice wood. In all such woods, there occur many vacant spaces, of greater or less extent. Into these vacant spaces larches are dropped during the first season after the wood is cut and enclosed. In the course of the six years that the enclosure must be preserved, these get above the reach of cattle, and will, one day, add much valuable timber to the general stock.

Within these twenty years, about 1200 acres have thus been planted on his Grace's estate in Buchanan; which, reckoning according to the proportions mentioned above, amounts to one million two hundred thousand oaks  
and



(and ashes) with nearly two millions of Scots fir and larches.

It is only necessary to add a few words with regard to the method of pruning these plantations, which is practised.

In the summer pruning of the old oak timber at Buchanan, the wounds are covered with pitch, or with a composition into which pitch enters. This attention is not paid to oak coppice-wood.

The best season for pruning the pine tribe is the month of April, when the juices begin to flow: at that time as much resin will flow from the wound as will form an enamel over it.

It is altogether unnecessary to enlarge on the character and uses of the various species of trees that are principally cultivated in modern plantations. The maple (*acer pseudoplatanus*) is much used in various kinds of machinery. The beauty, the rapid growth, the hardness and incombustibility of the larch have given it a decided preference to the Scots fir. It is known, however, to be liable to one disadvantage; it is liable to *cast*, as we call it, or to warp, after having been sawn into deals, which renders it less proper for flooring, as well as many other purposes. Whether this may be remedied by delaying to use it for a considerable time after it is sawn, and by placing it in a certain form, with the application of forces sufficient to counteract this tendency to warping, remains to be ascertained.

Birch, when sheltered from the bite of cattle, grows naturally, even to the summits of our mountains, at least, those of the second order, as may be seen in the inaccessible glens and crannies of upper Buchanan and Drymen.

Drymen. Could the expence of enclosing be encountered by proprietors, what an incalculable benefit would arise from sheltering these weather-beaten stations with belts of this hardy tree!

Before closing this subject, it may be proper to take notice of one species of plantation which has been lately introduced into Stirlingshire, and which promises to prove of great advantage.

The cultivation of a species of willow, called here the *red saugh*, has been long practised in the carse of this county. It is of rapid growth, and very useful for many domestic and rural purposes. A young man, who has planted this tree, may live to see it ready for cutting before he is very old.

But the willow plantation which is now held in view is that lately established on the estate of Mr Foyer of Bogside, in the parish of Baldernock. A piece of low lying reddish clay ground, consisting of about ten acres, is held in lease, and a willow plantation formed on it, by Mr William Atwell, basket maker, King-street, Glasgow. He plants about 45,000 willow stocks to the acre; preferring that thickness, contrary to the general practice of planting thinner, because, during the first two or three years, they are more productive of twigs for baskets; and because, when the stocks have attained sufficient strength to bear hoops for hogsheads, these, being confined to a narrow space, shoot up straighter, and fitter for the cooper, than if allowed to straggle. As this plantation is yet in its infancy, it would be premature to attempt a calculation of its advantages. Mr Atwell has another plantation of willows, of three or four acres, in the neighbourhood of

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Glasgow,

Glasgow, which, in point of luxuriance, and the selection of the most approved varieties of the willow tribe, is esteemed a curiosity. This, indeed, as well as the other, is too young to produce hoops, which, in Mr Atwell's opinion, ought not to be allowed to grow till the stocks have acquired a considerable degree of vigour. The varieties of which he most approves are the yellow, the Huntingdon, the Spaniard, and a *new kind*,\* which has not yet obtained a specific name.

#### *Form of Plantations.*

Having spoken so largely of the mode of conducting plantations in this county, it may be proper to add a few words with respect to their *form*. They are constructed, especially when designed for shelter, in the form of belts, or lengthened slips, of various depth.

In a district like this, where the south-west wind sweeps over a narrow isthmus for about 137 days in the year, the construction and direction of these belts is of peculiar importance. When they are designed for shelter, they ought always, when circumstances will permit, to be directed from N.W. to S.E. so as to break the violence of those winds which principally annoy this climate.

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\* For the above particulars with regard to willow plantations, the Reporter is indebted to his ingenious friend, the Rev. Mr Stirling of Pott, who has himself lately formed a willow plantation, with a fair prospect of success.

The necessity of this attention is obvious to every eye in the bleak districts of Slamannan, and the western part of Muiravonside. There the soil is light and meagre; and some grounds held in cultivation are elevated, as has been noticed,\* 620 feet above the level of the sea. Shelter is here the great desideratum. In Slamannan little has been done in this way; and the few belts that occur are by far too narrow and scanty. In the eastern district of Muiravonside, the subject seems to be better understood, and the practice applied with happy effect. The belts of planting are directed so as to ward off the most pernicious blasts, and they are of considerable depth. Though they are of recent origin in this quarter, their beneficial effects are already evident. The soil appears to be ameliorated, and the produce improved, precisely in the measure that shelter is given, by the judicious direction and progressive advancement of these belts of planting. Indeed, there can be no doubt that the climate, and consequently the soil of any country, may be improved in an incalculable degree by increasing the shelter given by plantations.

Hedge-row trees have the same effect, so far as their influence extends, and they are frequent in the lower parts of this county. They not only add to the beauty of any country, but, in process of time, they become timber. And, if in this district they have not succeeded so well as the trees in plantations, the obvious causes are, the violence of the blasts, and the want of shelter, which may, by attention, be removed.

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\* See p. 8.

## SECT. IV.—TIMBER.

STIRLINGSHIRE may be justly denominated a well-timbered county, throughout the greatest part of its extent. The reserves in the coppice woods alone, which have been already noticed as having arrived, many of them, at a large size, amount to many thousands. There is much fine timber, oak, beech, ash, &c. in the lawn at Buchanan. At Killearn, the estate of Sir James Montgomery, Baronet, [there are larches, planted about sixty years ago, which are more than 100 feet high, and above nine feet in circumference. There is a great quantity of full grown wood, consisting of oak, ash, beech, elm, and maple, on the estates of Boquhan, Gargunnoch, Touch, Sauchie, Bannockburn, Polmaise, Culcruch, &c. &c. The timber in the lawn at Callander house is remarkable for its age and quantity and size, and the era of its having been planted approaches to a certainty. The Earl of Callander had accompanied Charles II. in his exile, during the commonwealth. Upon his return, at the restoration, he employed himself in embellishing his estate, in the style that he had observed on the continent, and particularly in planting various kinds of forest trees. These trees are now, of consequence, a century and a half old.

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There are instances in this county of oak coppice wood having been allowed to become timber, by thinning the trees, suppressing the underwood, and withholding the axe. There is a beautiful wood of this kind to the east of Buchanan house. Callander wood, of near 300 acres, undoubtedly a coppice originally, has been treated in this manner, and has now become timber.

*Remarkable Trees.*

Some oaks in the lawn of Buchanan are probably near three hundred years old. They have grown to a great size. Their beautiful forms, and picturesque appearance, are very striking.

At Blarchois, in the parish of Strathblane, there are two remarkable oaks, under the largest of which the road passes. "It is 15 feet in circumference; and its branches form the radii of a circle 30 yards in diameter. The other grows near it, and though not quite so large, is a more beautiful tree, having a taller trunk, and being more closely covered with foliage."\* Indeed, the larger tree, it may be remarked, is fast verging to decay.

There is in the parish of Drymen an alder tree (*betula alnus*) which, in 1795, measured 19½ feet round the trunk. Its arms were then decayed, and dropping off; but new shoots were, at the same time, springing

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\* Stat. Acc. Vol. XVIII. p. 580.

out from the top of the stem, which have since become respectable branches.

There is an ash tree in the church yard of Drymen which is said to be 150 years old: at one foot above the ground, it measures 15 feet in circumference, and at the middle of the trunk, 13 feet 8 inches.

In the middle of Torwood, in the parish of Dunipace, stood the celebrated tree called WALLACE'S OAK, in the hollow trunk of which that hero is said to have secreted himself after his defeat in the north. It is said, when entire, to have measured 12 feet in diameter, or about 36 feet in circumference.\* Of this tree only a few decayed fragments now remain, and these will also soon disappear, from the eagerness of the virtuosi to obtain even the smallest portion of them as a memorial of that patriot warrior.

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\* Stat. Acc. Vol. III. p. 336.

## CHAPTER XI.

## W A S T E S.

**I**F by WASTES are to be understood *commons*, or lands of which no individual possesses the exclusive property, but of which a number of adjacent proprietors claim the common use, it may be observed that there is very little land of this description in Stirlingshire.

There is one tract of moorish ground, of about 360 acres, in the parish of Polmont, of this description. It is of little value. Perhaps a few other instances of the same kind may occur.

In the immediate vicinity of Falkirk, a tract of about 150 acres, the property of Mr Forbes of Callander, much of which is of excellent quality, and all capable of improvement, was occupied, for time immemorial, by the feuars of the village, as a common, for feal and



divot (for covering their houses) and for pasturage. It was consequently in a state of nature, and mostly covered with furze. The houses in Falkirk being now generally slated, the servitude became of little use, and the villagers have resigned it to Mr Forbes for a valuable consideration: He is now improving it in a proper stile; so that this tract of land, formerly of no value, will soon add to the beauty as well as to the riches of this district.

If again, by wastes we are to understand ground that has not been yet applied, or that is incapable of being applied to the production of grain, we must conclude, that of the 328,000 Scots acres which the county is reckoned to contain, 220,000 acres must be denominated *waste*.\*

This, however, would be a very erroneous estimate. In Stirlingshire there are certainly 8000 acres occupied by coppice woods, plantations, and timber; 2000 acres are a sufficiently low estimate for lakes, ponds, rivers, roads, towns, and villages. There will remain 210,000 acres, of which we may account 195,000 as pasture; and of this, at least two-thirds, including the whole range of the Lennox hills, together with Benlomond, may be considered as constituting pasture ground inferior to none in Scotland. The heaths of Buchanan and Drymen, though they are not of so good quality, are still valuable sheep-pastures; and what affords valuable pasture for sheep cannot be denominated a waste.

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\* See p. 39.

There will remain, then, to be considered as wastes, only the mosses of various depth and quality, which occur, of greater or less extent, in almost every district of this county; and the whole of these may be estimated as amounting to 16 or 17,000 acres.

Of these many, it must be acknowledged, appear to be impracticable.\* The moss of Alva, the great moss that stretches eastward from Cumbernauld through Slamannan, Muiravonside, and Polmont, with some of the deep mosses in the upper parts of Buchanan and Drymen, seem to come under this character.

But whatever the scientific discoveries and practice of future ages may be able to effect with regard to these, there is every reason to expect, that not only the light and shallow moorish grounds which abound in this county may be improved, but even that the patches of deep moss which disfigure the fertile plains of Airth, St. Ninians, and Kippen, will soon disappear, and give way to the rich clay soil on which they are incumbent.

1. With respect to the shallow mosses and moorish lands which extend widely through the parishes of Buchanan, Drymen, Balfroun, St. Ninians, &c. perhaps the most beneficial purpose to which they can be applied, or to which nature admits of their application, is the pasture of cattle. And, in this view, all perhaps that is in the power of human industry to do, is to improve the soil and herbage by sheltering it from the impetuous winds, by draining off the superfluous moisture,

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\* See p. 39.

ture, and *sometimes* by paring and burning the surface.\*

Of all these methods of amelioration, however, it is presumed that none will prove more effectual than that of sheltering the soil by plantations, which, if formed of the hardy natives of these regions, birch, alder, and mountain ash, to which might be added the Scots fir, would, in process of time, give warmth to the climate, and nourishment to the herbage, even on very high elevations. It is certain that the most beneficial effects might be produced in this way, in the bleaker districts of Slamannan, Muiravonside, Denny, St. Ninians, Balfroun, and Drymen. The practice of burning the heath upon the mountains in early spring has been mentioned,† and contributes greatly to the improvement of the herbage.

On the outskirts of the heaths of Balfroun, where the mossy stratum does not exceed a few inches in depth, many acres have been restored to a state of productiveness by tearing up the ground with the heavy Scots plough, giving it a year's fallow, and adding a copious dose of lime. Where the depth of the mossy stratum is inconsiderable, this method will, in almost every instance, be accompanied with success.

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\* When paring and burning are employed, it will be necessary to restore and improve the herbage, by sowing the native grasses, such as the *festuca ovina*, the *alopecurus*, the poas, *anthoxanthum odoratum*, *holcus mollis et lanatus*, white clover, &c.

† P. 26.

II. With regard to the deep mosses of Kippen, St. Ninians, and Airth, though their extent is now inconsiderable, and their present value almost equal to nothing, they hold a place of high importance in the eye of the agriculturist, with regard to their history, the mode of their improvement, and their certain future value.

The history of the low lying mosses on the Forth has been already sketched; \* it now remains to speak of the method which is employed to reduce them, and to recover the subjacent soil.

It appears that Mr James Ure of Skirgarton, in the parish of Kippen, was the first who, about the year 1750, conceived the idea of floating off the moss soil into the Forth, by a stream of water; an idea which has been so happily adopted and pursued there, and in the adjacent extensive moss of Blairdrummond, and which has already added to the productive soil of this district, many thousand acres of the richest quality. Mr Ure first tried to carry off a small stripe of his moss by means of a rivulet that runs into the Forth; and, finding that the scheme was easily practicable, he entered into a contract with his neighbour, Mr Edmonstone of Broich, (without whose concurrence he could not act, on account of the levels, and the interference of their lands) to carry in a stream of water upon their joint property in the moss. They began by clearing away the upper stratum, which, as has been stated in giving

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\* P. 39, 40.

giving the history of this moss, consists of a soft spongy substance of no value : they next digged the subjacent stratum down to the clay for fuel ; and thus, every year, a small portion of rich carse soil was gained.

The same method, nearly, is still employed, in reducing these mosses. They consist, as has been stated,\* of two strata ; the superior one of a soft, white, spongy substance, to the depth of five or six feet ; the inferior, of a black, compact peat, to the depth of four or five feet, and the whole mass incumbent on a rich clay.

In order to remove this body of moss, or peat earth, the first step is to draw a ditch round the whole area, of a depth somewhat greater than the upper, or spongy stratum ; then every person who has occasion to procure fuel from this moss employs himself for some days during the winter and spring, in throwing the upper stratum into the ditch, into which the stream is now admitted, and the stuff is carried off into the Forth.

In this manner, a stripe of ground, from ten to fifteen feet in breadth, is annually cleared of the upper stratum around the whole area of the mossy soil. The lower stratum of black, compact peat earth, remains ; and in this the people of the neighbourhood dig their fuel, and on its surface they *spread* out their peats to dry ; whence this space, which had been cleared of the spongy upper stratum, is here called *spreadfield*.

But as the quantity of fuel that is annually digged exhausts only a small proportion of the space that had been

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\* P. 40.

been annually cleared of the upper stratum, the method practised is this: when, in process of time, the *spreadfield* has acquired an extent of about thirty or forty yards, a ditch or canal is drawn around it, at its upper extremity, where it joins the unreclaimed moss. There is, at the same time, a deep ditch formed around the extreme verge of the whole area: this ditch extends to the depth of a foot or eighteen inches in the subjacent clay. The two ditches or canals form concentric circles, including the *spreadfield* in the intermediate space.

This *spreadfield*, or intermediate space, is now divided into small longitudinal portions, resembling the lazy beds in which potatoes are sometimes planted, by canals or ditches, forming segments of the diameter of the concentric circles which surround the mossy area. The stream is now let into the innermost canal, and the small canals are, at the same time, filled. Men are stationed on each side of them, who toss in the peat earth with their spades; it is carried by the stream into the deep ditch which surrounds the area, and floated into the river.

In this process, a thin stratum of nine or twelve inches is left, above the clay, consisting partly of black peat earth, and partly of the remains of wood. This, in the dry season (generally in the month of August), is burnt, and contributes to the fertilization of the newly-acquired soil. The roots of the oaks, which still stick fast in the clay, are gradually dug out, or burnt, which is often a tedious, and always a laborious operation. The soil thus recovered is henceforth a rich arable carse.

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To make an acre of *spreadfield* arable, by the above process, Mr Galbraith of Blackhouse, who has himself, in the course of forty years, cleared more than twenty-four acres, states the expence to be from 12l. to 16l. The land, thus cleared, will yield four, and sometimes five good crops of oats, without manure; and this he finds to be the surest crop, after such a soil has been newly recovered. Some of his neighbours, after having taken this course of crops, leave the ground in this exhausted condition; and it is remarkable that the soil is in a short time covered, as the Reporter observed, with the *phleum pratense*, and the *holcus lanatus*; and the ditches luxuriantly filled with the *poa aquatica*, all of which grasses cattle are extremely fond of. Mr Galbraith, however, disapproves of this exhausting process. His own method is, after having taken three crops of oats, to summer-fallow the ground, and to give it a copious dose of lime; and he finds that, after it is well wrought up, and the manure incorporated with the soil, it will produce abundant crops of wheat, beans, barley, &c. for several years.

This process of recovering soils covered by a deep stratum of moss, it must be acknowledged, is slow; but, to remove the whole mass, from top to bottom at once, would require more than double the expence which has been stated as necessary to the rendering an acre of *spreadfield* arable. It must be kept in view, besides, that, in the Kippen mosses, regard is had to the future supply of fuel to the adjacent district.

In reducing the great moss of Blairdrummond, which, lying in the county of Perth, falls not to be described minutely in this work, the process is somewhat

what different in its detail, though founded entirely upon the same principle. There, the moss is let out, in small lots, to families, which have, at length, become so numerous as to form populous villages. Their leases contain clauses by which they are obliged to clear a certain space in a certain time, and, having no other occupation, it is their interest to clear their lots as expeditiously as possible. Besides a considerable rivulet which traverses the moss at Kincardine, water is supplied from the river Teath, which is raised by means of a Persian wheel, and conveyed by a wooden pipe, of eighteen inches in diameter, into a reservoir centrally situated in the moss. From this reservoir the water is distributed to the occupants of the different lots according to certain fixed regulations: and every occupant, at the proper season, and when he enjoys the command of water, tumbles the moss from top to bottom, into small canals previously formed, and floats it off into the river; still leaving, as in the instance of the Kippen mosses, some inches of peat earth, to be burnt, or incorporated with the soil.

It is proper to state, that a gentleman of this district made an attempt, some years ago, to improve a considerable piece of his moss after the Ayrshire method, by draining the surface, by digging it, and laying on lime; but the experiment did not succeed. Mr Galbraith also tried to improve two acres of moss after the same method, the one on the high moss, the other on the *spreadfield*. He states that he had a tolerable crop of potatoes; but that a crop of oats and grass did not succeed.

Indeed,



Indeed, when the constitution of these extensive mosses, as it has been already described, is considered, it will not appear surprising that attempts at surface-improvement should always fail. In mosses like these, of a depth from nine to eleven feet, the upper stratum of which consists of a wet spongy substance, it cannot be expected that any manure will convert much of it into a soil favourable for vegetation : and even though, by accumulating manure upon the surface, an adventitious stratum of good soil may be created, still the inert cold mass that lies below must have the effect of chilling the surface, and of destroying vegetation. The Ayrshire method may do, and has actually proved effectual in reducing mosses of small depth, and of a favourable declivity ; but as to the deep and level mosses of Airth, St Ninians, Kippen, and Kinsardine, to remove the whole mass, and to expose the subjacent clay, appears to be the only certain mode of improvement.

As to forests, there are now none properly so called in Stirlingshire. The forests of Callander and Torwood, of which some traces still remain, were royal forests ; as was also that of Dundaff, which has, long ago, totally disappeared.

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UPON the whole, with regard to the WASTES of Stirlingshire, it may be observed, that, though there is only a very small portion of the county which falls to be considered as totally inapplicable to the purposes  
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either of pasture or of agriculture, still, it must be acknowledged that there are many extensive tracts of ground, which might be made, by industry, to yield returns incalculably larger than they produce at present. In a national point of view, especially at the present period, there cannot be an object of greater importance than that of rendering the British empire independent of imports of grain from foreign countries; and of even making the culture and productiveness of our own soil keep pace with the demands of an increasing population.

We know what some ancient nations have done, whose population exceeded the ordinary productiveness of the soil. In the mountains of ancient Palestine, every particle of the soil was occupied in producing food for man. Barren rocks were rendered fertile, by carrying earth to them from a distance. The narrowest slips of soil, on the faces of the hills, were propped up with walls, and carefully cultivated. In Japan, a climate naturally bleak and unfertile, we are informed \* that the mountains are cultivated to the very summit. Not a particle of any substance fit for fertilizing the soil is lost; but even on the public roads, and in the streets of the towns, receptacles are provided for preserving substances so useful in supplying the wants of an industrious and populous nation.

How must one be filled with regret to observe the little attention that is paid, in many districts of our own  
Q country,

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\* See Thunberg's Travels in Japan.

country, to objects of such high importance. Whilst our ingenuity and industry have carried the arts to a degree of perfection which no nation ancient or modern has ever reached, agriculture is, in many instances, only beginning to emerge into notice. How many precious tracts of ground, well fitted for producing food for man, meet the eye in every quarter, lying in a state of nature? In the higher districts of Stirlingshire, where, in former times, the population was greater, but is now diminished by emigrations to the manufacturing towns and villages, marks of a cultivation, prompted by necessity, may be traced pretty far up on the skirts of the mountains. These lands, once under the operation of the spade or of the plough, might be again easily brought into cultivation, with all the ameliorations which they have acquired from nature, in a course of successive years.

## CHAPTER XII.

## IMPROVEMENTS.

## SECT. I.—DRAINING.

**AS** a certain degree of moisture is necessary to vegetation, so a superabundance of it, lodged in the soil, is destructive of the growth of useful vegetables, and promotes that of aquatic plants of little value.

In Stirlingshire, the methods which have been invented for removing superabundant moisture are only of recent introduction, and are employed only on a very circumscribed scale.

Elkington's manner of draining has been brought into use by some enterprising agriculturists, and is, without question, the most effectual of all others, in porous soils, which abound in springs.—It would seem to be preposterous to enter, on this occasion, into a detailed

description of this method, which is now so well known, and an account of which may be found in every treatise on agriculture.

The grand principle upon which this method is founded is, the detection of the subterraneous source or reservoir, in which the superabundant moisture originates; and the next step is, to carry it off by cuts of sufficient depth to reach this reservoir, or by boring and tapping, according to circumstances.

All that seems necessary to be suggested further is, that the aquatic plants which grow on such soils will always prove sure guides in detecting the sources of the springs. Wherever the various species of *junci* or rushes cover the soil, a certain indication is afforded of subterraneous water. Water cresses, *ranunculus hederaceus*, *veronica becabunga*, and particularly that minute plant, the *montia fontana*, furnish the most decisive indications of a soil full of springs. A little attention to observations of this kind, directed by an ordinary degree of common sense, will enable any man to practise the Elkingtonian mode of draining, without further instruction.

The proper draining of the carse soil of Stirlingshire, when its great value is considered, must appear to be an object of peculiar interest. There are, indeed, few springs in the corses, and there is accordingly little occasion for under-draining. But *surface-draining* is here more necessary than in any other soil whatever. The subsoil of carse land is compact, and not easily pervious to water; and, in the course of agricultural operations, during a long series of years, this compactness is continually increased by the tread of horses,

horses, and by the weight of the implements that are employed.

In these carse grounds, it was the custom, of old, to cut open drains of ten feet wide, and of a very considerable depth. The object that was principally had in view was to procure clay from these ditches for manuring the adjacent fields. The clay was allowed to lie a year upon the ground; it was then mixed with dung, and spread out upon barley ground. But, since summer-fallowing and the culture of wheat have been so generally introduced, this practice has gone into disuse: the wide drains are filled up, and their place supplied by small open drains, to carry off the superfluous water into a large common drain, which conveys it into the river. By this method, much ground is saved, and held under crop, which was formerly useless.

With regard to these open drains, which are indispensably necessary to carry off the water that falls from the sky, and lodges upon the surface, it is much to be regretted that, in too many instances, little attention is paid to giving them a proper depth, or clearing them when they are choaked up. These lands, as has been stated, are only a few feet above the level of the Forth; and it is obvious that when the drains are not of a sufficient depth, the surface of the water which they contain will be nearly on a level with the adjacent fields, and that, instead of draining off, they will send back the water upon them. This situation of things is too frequent in the carses.

An instance in point, of the beneficial effects even of deep ploughing, in draining carse lands, was obligingly communicated to the Reporter by the intelligent pro-

prietor of the estate of Leckie,\* situated upon the Forth, a few miles to the west of Stirling.—When he succeeded, about seventeen years ago, to this estate, which contains near 1000 acres of carse, he found the soil a *caput mortuum*, and altogether unproductive. It had been under cultivation for a long series of years. The practice had been to plough only to the depth of two inches, or two inches and a half. That small portion of the soil had, accordingly, by continued cultivation, become much pulverized; whilst the subjacent stratum had, on the other hand, become hardened and compacted by the same process, so as to become totally impervious to water. The water consequently stagnated between the soil that was held in cultivation, and that which lay immediately beneath it, as if the latter had been till or rock.

This gentleman, happening to travel over a similar soil in the neighbourhood, remarked an acre of carse ground which the occupier had *trenched*, or dug up to a considerable depth, with the spade; whilst an adjacent field, of the same quality, continued to be cultivated according to the old practice. He observed that, in harvest, the acre that had been dug with the spade produced a luxuriant crop, whilst the neighbouring field was unproductive.

The hint suggested by these observations was immediately adopted. The gentleman caused his carse lands to be ploughed to twice the depth that they had formerly

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\* Dr. Moir.

merly been; and drains were, at the same time, constructed to carry off the superfluous moisture. By this process, a vast addition was made to the permanent staple of the soil. By the continued influence of the atmosphere, loaded as it is with the natural acids which are so conducive to vegetation, the ground is soon rendered and long continues fertile.

By this simple *improvement* of ploughing deep, the water, which was formerly lodged 2½ inches below the surface, now finds room to diffuse itself; and what is superfluous is carried off by proper drains. The subjacent soil, being subjected to less pressure, has become, in a certain degree, porous. In short, these corses have become dry.

It is worth while to remark, that a most material consequence with regard to the healthiness of this vicinity has followed this improvement. The gentleman, who had the goodness to communicate the above account, had formerly practised, with great reputation, as a physician in Stirling. During the period of his practice, he states that intermittent fevers were annually epidemic in the corses of Gargunneock and Kippen, occasioned evidently by the infectious miasmata arising from the wet soil, impregnated with the animal and vegetable substances which had been employed as manure, together with the exuviae of plants which had been left to rot upon the ground. Since the soil has been rendered dry, however, by the new mode of cultivation which has been described, intermittent fevers have disappeared, and are now altogether unknown in that neighbourhood.



It may, perhaps, be asked whether the vapours which arise from the vast tracts of moss that are situated in this neighbourhood, may not be expected to produce the same diseases, and to continue their prevalence as formerly. The fact is, that they are not found to do this. The vapours that arise from moss, or peat-earth, are not miasmatic, and are not found to produce ill effects upon health. Peat-earth consists of a collection of vegetable substances held in an insoluble state by an antiseptic acid. The inhabitants of the moss villages at Blairdrummond are as healthy as any in the neighbourhood.

With regard to the form of the close or covered drains which are employed to carry off collections of subterraneous waters, a few words will suffice.

The most perfect, as well as the most expensive, is that in which the bottom is first covered with flags; (if the bottom be a hard till, this expence may be saved) a wall of some inches in height is built upon each side, and flags laid over at top. The earth is then levelled over the whole. In the extensive lawn of Buchanan, much draining has been executed in this manner, with the happiest effect.

A less expensive form of covered drains is to place the flags on edge, in the bottom, inclining towards each other in the form of an angle, or pavilion, at top. Small stones are then thrown in, which consolidate the flags in that position, and the whole is covered over with earth.

Another method is, after the ditch has been dug to a proper depth, to fill it up to the height of 18 inches with loose stones, the largest at the bottom, and the smaller

smaller ones at the top. It is usual to cover these with broom, furze, juniper, or other brush-wood; and the whole is covered with earth, the green side of the first turf being generally turned down. These are, in this county, called *rumbling syvers*, or drains.

To all these kinds of covered drains the mole is a noted enemy, by perforating the banks, and throwing in the earth, by which the course of the waters is often choked.

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#### SECT. II.—PARING AND BURNING.

Of these operations some notice has been taken already, \* as being generally attended with more loss than profit. They were formerly much practised on the shallow outskirts of the mosses of Buchlyvie, Kippen, and Gargunnoch; but have now fallen greatly into disuse. Paring and burning, however, may be beneficial, and even necessary, in soils that are covered with a thin stratum of cold unproductive peat-earth. By destroying this inert stratum by fire, we get at the rich soil with which it is covered, and the ashes which are produced furnish a very suitable manure.

SECT.

## SECT. III.—MANURING.

MANURING is the art of preserving the soil in a condition fit for producing the greatest returns of which it is capable, by the addition of extraneous substances, which have been found, by experience, to effect that purpose. There is no subject connected with agriculture in which the application of chemical principles appears to be more necessary than in that of *manures*.

Vegetables have been found to exhaust the soil of certain elements, which, again, are actually found, upon analysing these vegetables, to have passed into them, and to constitute a portion of their substance. Thus wheat has been found to contain about 37 parts in 100 of calcareous matter, and red clover 33 parts in the same quantity. Hence, it necessarily follows, that, in order to render any soil capable of producing these valuable plants in abundance, it must be copiously impregnated with calcareous matter.

It appears that nature has produced no soil which, without occasional additions, is capable of producing successive and abundant crops; whilst, at the same time, there are few which may not, by the aid of human industry, be rendered productive. To mix up the soil in the proper proportions of the various ingredients which constitute vegetable mould must therefore be considered as the most essential branch of the agriculturist's art.

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The principal elements which constitute the soil are, silex, or sandy particles; argil, or clay; and calcareous substances, or lime, under its different modifications.

Where silex bears too great a proportion in the soil, it is not sufficiently retentive of moisture to favour vegetation; but the skilful agriculturist corrects this by a proper mixture of argillaceous earth. Where, again, the proportion of argil is excessive, the soil is not sufficiently porous: the water accumulates on its surface, and destroys vegetation. This error of the soil may be corrected by adding a proper proportion of silex and of lime.

In estimating the fertility of soils, attention should be paid to the quantity of rain that falls annually. In a dry climate, argil should preponderate, to retain the moisture: in a wet climate, silex should abound, to filtrate it off.

Mr Kirwan esteems that a *dry* climate, where the quantity of rain that falls annually does not exceed 27 inches: when the rain that falls exceeds that quantity, he considers it as *wet*. Nature, for the most part, has generously suited the soil to the climate. Mr Kirwan observes, that at Turin 40 inches of rain fall annually, and that the soil contains from 77 to 80 per cent. of silex: that at Upsal, it rains 24 inches, and that the silex is 56, the calcareous matter 30, (and the argil probably makes up the remainder of the 100.) At Paris, the quantity of rain is still less, and the proportion of silex is from 46 to 51 in the 100.\*

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\* See Mr Kirwan's pamphlet on "the Principles of Vegetation."

In a climate like Stirlingshire, where the quantity of rain that falls is about 29 inches, taking the medium of the county, and where some rain falls during 206 days in the year, \* it is evident that that condition of the soil is the best, in which silex and calcareous matter greatly exceed the proportion of the argil. Perhaps 60 parts of silex, 25 of lime, and 15 parts of argil may, in this district of Scotland, be considered as the most advantageous proportion.

Having taken the liberty to premise these few simple, but seemingly necessary remarks, on a subject so interesting to the agriculturist, let us now proceed to consider the particular additions which are generally given to the soil, in this county, under the name of manures.

Manures may be conveniently distinguished, both with respect to their chemical properties, and their use, into calcareous and putrefactive.

### *I. Of Calcareous Manures.*

1. Marl. This is a compound of clay, silex, and calcareous matter; and from this last ingredient it will probably be allowed that it derives its principal efficacy in promoting vegetation. Marl is denominated argillaceous, silicious, or calcareous, according as any one of these substances predominates. The last is sometimes called shell marl. A marl of a very bad consistence (hence called stone-marl) has been found in the copper

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\* See p. 9.

copper mines at Aithrey, and applied to the soil with some success. All marls effervesce with acids.

There has not been much marl found in Stirling-shire, nor has it been diligently searched for, on account of the abundance and superior quality of the lime, which is so easily to be obtained in the eastern and southern districts of the county.

In a marshy bog, upon the estate of Lord Dundas, within a mile of Falkirk, a bed of clay marl has been lately discovered, of about six feet in thickness, with a bed of moss above, and another below it. This discovery is likely to be attended with much advantage to the neighbourhood; and there is little doubt that similar discoveries may be made in the adjacent parishes. Marl has also been found, and dug in considerable quantities, in the parish of Muiravonside; and produces a good effect, when spread upon young grass and pasture lands. Marl is found in St Ninians parish; "but the use of it has, of late, been almost entirely discontinued." There lime of the best quality is abundant.

2. Lime. Of all the substances which have been employed for the amelioration of the soil, that of lime is perhaps the most general. There are few soils of such a nature as not to receive benefit from the application of lime; and such is the liberality of nature, that there are few countries which are deprived of a substance so essential to vegetation. "Of all the salifiable bases," says Lavoisier, "lime is the most universally spread through nature."\*

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\* Kerr's Translation of Lavoisier's Elements.

Though the practical use of lime, however, as a manure, is so ancient and universal, it does not appear that speculative men have hitherto agreed on any fixed principle with regard to the manner in which it acts; and there must consequently be a difference of opinion and of practice with respect to its application. Were the question concerning the precise effect of lime merely speculative, a difference of opinion on the subject would be of little consequence. But there is reason to believe that certain views, which have been entertained on this point, have led to errors in practice. Correct views, on the other hand, with regard to the theory, may be expected to lead to the most advantageous mode of applying this important substance. The Reporter then, who has frequently remarked the waste of calcareous substances, in their improper application, hopes that he will be forgiven both by the practical farmer and the philosopher, when he presumes to enter, at some more length, on this subject.

There is an obvious and well known effect of lime, for the account of which, it would appear, that we have not far to search, and that is, its tendency to penetrate downwards through the porous mould, and to form a crust on the unfertile subsoil. It would seem that lime does not produce this part of its effect merely by the principle of gravity: for, in its progress downwards, it leaves behind it many substances heavier than itself; but by some chemical principle, analogous, perhaps, to that of *precipitation*. This property of lime is certainly, in one respect, beneficial to the soil, by extending the staple of the vegetable mould, and by rendering it porous, and less retentive of water.

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There is reason to believe, however, that this is but a very inconsiderable part of the effect of lime in ameliorating the soil; and that if this tendency to penetrate towards the subsoil be not counteracted by a judicious mode of application, its virtues will be in a great measure lost.

It has been the opinion of many, that the effect of lime in ameliorating the soil, consists chiefly in that caustic property which it possesses in an eminent degree immediately after it is burnt; and in which state it is most generally applied. It has been supposed that by burning up the leaves and roots of useless and noxious plants which abound in the soil, it converts them into a rich manure. By those who embrace this opinion, lime will be applied to the soil immediately after it is calcined, and ploughed down as soon as possible, in order that none of its acrid and caustic qualities may be lost in the atmosphere.

There is no doubt that *certain* advantages arise from the application of lime in its caustic state:—it destroys noxious plants, particularly the mosses; and the soil is probably benefited by the temporary heat that is communicated. But there is reason to believe that the benefits derived from the mere causticity of lime are the least considerable of those which attend its application to the soil; and, if this opinion be just, it follows that to plough it down in this state is a pernicious practice.

In order to form a just estimate of the precise effect of lime in promoting vegetation, let us attend for a moment to its chemical principles. Limestone, in its uncalcined state, is well known to consist of an earthy basis,



basis, combined with carbonic acid gas. In this state, it is called carbonat of lime. By calcination, which is generally effected by applying a strong heat, this gas is expelled, and the earth, now become quicklime, and of a highly caustic quality, remains.

Quicklime still continues to possess a very strong affinity to its proper gas, *the carbonic acid*, and eagerly absorbs it, whenever it is presented. This gas exists, as has been stated, \* in the atmosphere. Quicklime, when exposed to the open air, is said by Mr Kirwan to recover its proper dose of carbonic acid gas in the space of a year. It has now become again carbonat of lime, possessed of precisely the same properties that it had before calcination, except that it is reduced by fire to an impalpable powder.

Quicklime is soluble in water. Dr Thomson states, "That water, at the common temperature of the atmosphere, dissolves about 0.002 parts of its weight of lime. This solution is called *lime water*." It follows, that, when spread upon the ground in the state of quicklime, it will be dissolved during the short period that it continues in that state by the moisture that resides in the soil, and by the rains that fall from the sky. But it soon becomes again almost insoluble, by recovering its proper dose of carbonic acid gas from the atmosphere. The effect of lime, therefore, in its caustic state is transient and inconsiderable.

It is allowed by physiologists, that carbonic acid gas constitutes a great proportion of the food of vegetables; the application of lime, then, is chiefly useful as it furnishes

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\* P. 122.

nishes this food. The question comes to be how, after having been converted into carbonat of lime, is it rendered soluble and fit for entering into the composition of plants? Could it be retained always in its caustic state, the account would be easy and obvious. But this state of lime is of very short duration, after it has been exposed to the atmosphere.

The fact seems to be, that certain acids are furnished partly by the atmosphere and partly by the soil itself, which produce the effect of dissolving the carbonat of lime, when tritured by calcination. Thus, for instance, it is well known that clay soils abound with the sulphuric acid; this readily combines with the lime; it disengages the carbonic acid gas, and the vegetables are supplied with their proper food. Clay soils, accordingly, are found to receive the greatest benefit from the application of lime. Many vegetables also furnish themselves the neutralizing acids with which lime readily combines. In enumerating the affinities of lime, Bergman places that with the oxalic acid in the foremost rank. Hence, probably the good effects of lime in correcting soils over-run with spirit.

From this view, many practical conclusions, of the highest importance to the agriculturist, necessarily follow.

1. It is evident that if limestone, in its native state, could be pounded by a machine into an impalpable powder, it would have nearly the same effect, in promoting vegetation that calcined lime possesses. The experiment has been tried; but it has been found, as might have been expected, that no machinery can re-

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duce limestone to a fine powder so effectually, or so cheaply, as burning does.

2. That lime is *principally* of use as a manure in its effete condition ; and that it is of little consequence whether it be of 2 years old, after calcination, or of 200. As soon as it recovers from the atmosphere its proper dose of carbonic acid gas, it has become carbonate of lime ; and, like the rock out of which it was originally dug, it will continue in that state until fire, or an acid, are again applied. Hence old rubbish of lime appears to be a most valuable manure. The age is nothing ; the quantity of calcareous matter contained is every thing.

3. But the most important conclusion from this doctrine, is, that lime, after being calcined, should be spread upon the ground for a long while before it is ploughed down, in order to afford time for its neutralization by the acids which are furnished by the atmosphere, and by the soil. It is then soluble in water, and capable of entering into the system of vegetation. In this view it would seem to be the most proper practice to spread quicklime upon grass lands, for a season, or for two seasons, before they are to be broken up.

Another practice, which is altogether consonant with the principles which have been suggested, is not uncommon in this county ;—and that is, to *harrow in* lime, along with wheat, barley, or potatoe-oats, when the field is, at the same time, laid down, and to remain under grass, for a season or more. It is obvious that the lime, thus left almost wholly upon the surface, will become every day more and more neutralized by the atmospheric gases : it will thus become soluble, and enter

ter easily into the food of the vegetables that had been sown. Its virtues will also continue long; and the crops that are to succeed, when the land is again to be broken down, will feel the benefit of this practice.

4. In this theory, the agriculturist may find sufficient security in his practice of laying on lime *alone*, without any saline addition. Lord Dundonald, in his ingenious treatise, "On the Connexion between Agriculture and Chemistry," states the grand effect of lime to be, "Its forming with the remains of vegetables which it finds in the soil an almost insoluble matter; unfit, indeed, for entering immediately into the process of vegetation; but which, with the addition of saline substances which art may supply, will form a rich, soapy, mucilaginous matter, which is highly conducive to the growth of plants."

His Lordship specifies several of those saline substances which ought to be added to lime, in order to give solubility to the vegetable matter with which it has been combined, particularly alkaline salts,—as soda, potass, and animal substances; with Glauber's salts, Epsom salts, sea salt, &c.

But where, it may be asked, are such saline substances to be obtained in such a quantity as is requisite to neutralize the calcareous matter which the farmer must apply to his soil? and how can he afford the price which must be paid for such an expensive manure?

It may be admitted, with his Lordship, that the beneficial effects of lime may be accelerated and increased by the addition of saline substances; but when we consider the difficulty, and even the impossibility of pro-

curing them in an adequate quantity, it would seem that the agriculturist is abundantly justified in his ordinary practice of laying on lime *alone*, by the doctrine that has been suggested, of the provision of an acid furnished by nature for neutralizing calcareous substances which have been applied to the soil

It is, at the same time, justly observed by Lord Dundonald, that lime should be applied to the ground with caution; and that, from over-liming, many pernicious consequences may ensue. These evil consequences, however, do not appear to arise from the operation of lime as an absorbent of the atmospheric acids; for the more that is absorbed of these, the greater is the quantity of saline substances that is generated. But the truth seems to be, that lime applied in too great a quantity is hurtful, because, by the peculiar property which it possesses of penetrating downwards, it disturbs the mechanical arrangement of the soil; it loosens the mould, and renders it too open and porous to sustain the weight of a heavy crop. Where lime has been applied superabundantly, its effects may be corrected by a proportioned use of alkaline salts, as dung, urine of cattle &c.,

These remarks may be concluded by adding that this doctrine, with regard to the abundance of neutralizing acids which nature furnishes, does not tend in any degree to abate the exertions of the husbandman, in accumulating the artificial salts in the greatest quantity that is in his power. As well might the manufacturer say that, as the influence of the sun, together with an alkaline ley, will bleach his cloth;—he will not employ the more expeditious method, lately invented, of bleaching  
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ing by an acid in the concentrated form in which it is furnished by art. Nature has, in this respect, done much; but it has been left to human industry to concentrate, and to hasten the effects which she, by a more gradual process, would at length accomplish.

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HAVING stated the properties of lime, with its application and effects, at such length, it seems altogether unnecessary to add any thing with regard to the other calcareous substances which are suggested in this section; such as limestone gravel, gypsum, shells, &c. The use of these, in this district, is extremely limited; and the principle upon which their effects depend is obvious.

## II. *Of Putrefactive Manures.*

ALL saline additions tend powerfully to promote the putrefaction of animal and vegetable substances, when applied in a proper proportion. In this view common salt might be used as a manure. It is well known that if common salt is applied to animal substances in a great quantity, it prevents putrefaction; it is only when applied in a small quantity that it accelerates that process. Were it to be obtained at an easy rate, it would be an useful addition to the dunghill.

Of all the putrefactive manures which are used, however, the dung and urine of cattle are those which are

applied most generally, and with the most powerful effect.

About 40 years ago, it was the universal practice in the western parts of this county to pen up both black cattle and sheep, during the night, in summer and harvest, in folds made up of hurdles fastened together, and enclosing a circular space of ley ground, as a preparation for breaking it up the ensuing season. After this space appeared to be sufficiently manured, the fold was shifted to another part of the field, and so on till the whole was gone over. This was called *Teathing*,—an unprofitable practice, as will be shewn, with regard to the quality of the manure; and especially pernicious with regard to the cattle, who were let loose in a narrow enclosure, in which the weaker were continually liable to be injured by the stronger. From this circumstance, and from the abolition of the distinction of infield and outfield (to the latter of which this *teathing* was always limited) the practice of folding cattle by night has for many years been disused.

There is another species of *teathing*, however, which is very generally practised in this county, and which appears to be no less pernicious than that which has been described. It is an ordinary practice, not only in the higher parts of this district, but even in the rich carses situated on the Forth, to carry out and to spread upon the fields the farm-yard dung, in the months of October and November, as a preparation for the next year's crop. In the higher parts of the county the dung is, for the most part, laid on grass lands; in the carses, it is laid on wheat stubble as a preparation for a crop of beans.

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If we attend to the philosophy of this subject. (an attention which the most experienced agriculturist should not despise)—it is evident that dung, like every other inflammable substance, when exposed for a considerable time to the atmosphere, will imbibe the oxygen of the air in a too abundant measure; and that, instead of remaining a putrified soluble substance, disposed to enter into the system of vegetation, it becomes inert and insoluble. Dung, by being long exposed to the air, will, in fact, be converted into a substance precisely of the same kind with the surface of peat mosses, which is equally unfit for fuel or for manure.

Add to this almost irremediable evil of oxygenation, that of the evaporation of the precious volatile salts with which dung is impregnated, together with the large proportion of its most nutritive juices, which, especially on sloping grounds, must be washed away by the rains, never to be recovered, and some estimate may be formed of the merits of *teathing*. Mr Walker of Falkirk, to whom the reporter has been so much indebted for important information on many subjects relating to agriculture, justly condemns this practice; and adds, "Would it not be better to plough in the dung to preserve the juices and to rot the stubble on which it is laid? But this," he adds, "would occasion a second ploughing before the beans are sown: No matter," says Mr Walker, "the crop would pay for the expence."

From these suggestions, it will easily follow, that the proper management of the dung and urine of cattle is one of the most important concerns in agriculture.



Notwithstanding the acknowledged importance, and the generally increasing value of dung, it is a fact no less singular than true, that the magistrates of Stirling have always been obliged, and are so at this day, to give a premium for the removal of the *town dung*, instead of adding by its sale to the revenue of the town. About six years ago, the premium given for removing the town dung was L.80. It is now yearly reduced, as the value of this manure begins to be properly felt: In 1809, the premium given was L.48.

That *town dung*, the most valuable in its kind, should be thus undervalued in one of the first agricultural districts in Scotland, the vicinity of Stirling,—can be accounted for only from the low state of agriculture in this quarter, (which cannot be said to be the case)—or from the vast abundance of lime so easily to be obtained in that neighbourhood.

With regard to *farm yard dung*, notice has been taken already of the general introduction of straw-yards in every considerable farm of this county. By the proper construction of these;—by sloping the area gently towards the centre;—by paving it; and even by employing plaster of clay or lime, to prevent the escape of the juices,—the alkaline substances, which are so conducive to vegetation, may be easily preserved and accumulated.

Indeed, too much attention cannot be paid to the construction and management of dunghills. But as nothing peculiar to Stirlingshire occurs in this respect, it may suffice to observe, that the grand object is, to produce fermentation, and the complete decomposition of the vegetable and animal substances of which the dunghill

hill consists. In this view, it is evident, that if the surface is too widely diffused, it becomes oxygenated, and is reduced to the quality of peat-earth: that if it is placed in a hollow from which the superabundant water cannot escape, no fermentation can take place; and that if it is situated so that all the moisture runs off, it must, as in the first instance, become in some degree oxygenated, and crumble into dust. A dunghill, then, should be situated upon a very gentle declivity, so that the waters may not stagnate around it; and if any juices run off, they may be arrested in their course by the admixture of proper materials,—particularly of peat-earth. The putrescency of dung may be promoted by a due degree of heat and moisture, and also by the addition of certain saline substances. Lord Dundonald recommends to farmers on the sea-coast to drench their dunghills from time to time with sea-water, which may be easily conveyed by pipes, or by canals.

In the farm yard, and feeding houses of Mr Walker, on the estate of Westertown, the Reporter observed a most proper attention to the preservation of the urine of the cattle, by having a small reservoir for its reception, which is filled up, from time to time, with straw, chaff, or some other substance calculated to absorb it.

In the western district of this county, the common fern, (*pteris aquilina*) is much used, and with great advantage, for litter, and for encreasing the volume of the dunghill. The whole sides of the mountains are there covered, for many miles, with this plant, which had been hitherto applied to scarce any other use than that of thatching cottages. When it is considered that fern, before it has lost its sap and verdure, contains a large proportion

proportion of alkaline salts, it would seem that nature, in clothing our mountains with it so abundantly had intended to compensate for their barrenness by their furnishing such a valuable material for the increase of fertilizing manures. The addition of fern, before it has become withered, to the straw yard and dunghill, cannot be too strongly recommended.

Previous to the prohibition of distilling from grain, the most valuable manure of all others was obtained from the numerous and extensive distilleries that were established in this county. Mr Belches states (1796) "That one cart load of that dung was reckoned equal to two of that which is produced upon a common farm. The superior quality," he adds, "is ascribed partly to the food on which the cattle are fattened, being the grain and wash from the stills, and partly that the cattle are very scantily littered, owing to the great number of them, when compared with the quantity of straw which the distillers can procure." Amongst the many evils which the agricultural interests of Scotland have suffered from the suppression of distillation from grain, it may be permitted observe that this of withdrawing such a powerful mean of fertilizing the soil is not to be accounted the least considerable.

As to the comparative merit of *rotten* dung, on the one hand, and long and fresh dung, on the other\*, various opinions have been entertained. The truth seems to be, that, for producing the next immediate crop in abundance, dung completely rotted is the most beneficial.

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\* Plan of the Board, article 21st of this section.

beneficial. But, if we attend to the subsequent crops, the preference is due to *long* and *fresh* dung, provided that it is ploughed in, and completely covered by the mould. *Long* dung seems to be particularly adapted to the culture of potatoes ; and dung completely rotted has been found to cause that crop to be worm-eaten and watery. Many persons use only common straw or litter for their potatoes ; and there is reason to believe that it contributes more to their growth, by preserving the soil in an open state, than by adding any thing of its own substance.

Before we quit the subject of manures, a short notice of the use of *peat earth* (a substance with which this county so much abounds) seems indispensable.

Peat earth ought not to be applied as a manure in its natural state ; for, if taken from the surface of mosses, it is oxygenated ; and, if from the bottom,—it is saturated with its peculiar acid. In both these states, it is completely insoluble : If it is applied to the soil, it produces only a crop of sorrel (the *rumex acetosella*) and it can be reduced only by the application of saline substances, especially the alkaline.

Lord Meadowbank has discovered, and introduced into practice, a method of reducing peat earth into a state of solubility which fits it to promote vegetation, and which seems to be the most complete that has been hitherto devised. With the liberality of a true philosopher, his Lordship has communicated this method to the public ; and the Reporter has actually seen it practised on his Grace the Duke of Montrose's farm at Buchanan, as well as in many other parts of this county. Though this method is probably detailed in every  
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county report connected with Scotland that has been published of late, it is considered as an attention due to the agriculturists of Stirlingshire to repeat the outlines of it.

Lord Meadowbank's method is "to mix, in as accurate a proportion as possible, *four* parts of peat-earth " with *one* part of dung : to divide the peat earth in- " to small pieces; and to throw up the whole mixture in a loose state, in order to favour fermentation. " This compost is formed into longitudinal heaps not " exceeding fifteen feet in breadth, and four feet and a " half in height. A fermentation soon takes place, " which should be allowed to rise to 90° of Fahrenheit; " and should it proceed beyond this, it must be checked by the addition of more peat, or by throwing on " water. When this heat has subsided considerably, " the whole heap is to be completely turned over; and, " in about the space of three weeks, a new fermentation, somewhat more moderate than the former, follows. The operation is now completed; and the " whole mass is reduced to the state of the richest " dung."

The importance of this discovery and practice cannot be too highly estimated.

Of the various other species of manures enumerated in this section of the plan of the Board, such as hair, hoofs, bones, feathers, rape dust, &c. &c. it does not appear necessary to speak; as the use of them is either altogether unknown in this county, or at least extremely rare and circumscribed. It may suffice to suggest, in general, that nothing is more essential to agriculture than the preservation and accumulation of every substance

stance that is convertible into manure. Besides the substances mentioned, the scourings of ditches and ponds, culinary ashes, chamber ley, and, as has been hinted before, the weedings of the fields, consisting of couch grass, swine's thistle, cursed thistle, *senecio jacobea*, *artemisia vulgaris*, &c. (if laid up in heaps, for two seasons to ferment)—all contribute to furnish excellent manure.

#### SECT. IV.—IRRIGATION.

OF the subject of irrigation, the Reporter professes himself to have only a very slight knowledge, whether with regard to its general practice in agriculture, or its particular application in Stirlingshire.

There can be no doubt that irrigation must prove highly beneficial to light and arenaceous lands; and it is probable that it produces its ameliorating effect principally by the deposition of calcareous matters, with which all waters are impregnated. Even rain water holds in solution carbonic acid, carbonat of lime, and a little muriat of lime \*. Irrigation, accordingly, is found to be effectual in destroying the mossy tribes, and in producing a deep verdure, just as lime does when used as a top dressing. This effect may be observed every day on the grassy declivities of our mountains.

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\* Thomson's Chemistry, vol. iii. p. 366.

tains. Wherever a little rill descends, without forming a channel for itself, but gently oozing through the grass, we find the mosses extirpated, and a rich sward covering the ground.

The only instances of irrigation which occurred in Stirlingshire were that of the great Carron Bog, of which notice has been taken already \* ; and that of an experiment made by Mr Johnstone of Alva with a very happy effect.

Mr Johnstone procured a person from England well versed in the method by which this operation is conducted in those districts where it is most generally practised. The rules by which this operator proceeded, and which he left for future application, were as follows.

The field to be irrigated, being situated upon a slope, at the bottom of the Ochill hills, a conduit is constructed along the upper extremity, in such a manner as to diffuse the water regularly over the surface of the lower grounds. Wherever this regularity of diffusion is interrupted by the inequality of the ground, cross cuts, or *feeders* as they are called, of smaller dimensions are made. All these conduits must be regularly cleansed, and preserved in constant order, during the period of flooding.

About the beginning of December, the water is to be admitted, and allowed to run over the field for the space of 24 days ; and then to be turned off till the end of the month ; it being always understood, that in the severity of frost, the water is to be turned off the ground,

\* P. 20.

ground, and not admitted again till the return of open weather \*.

January 1st, admit the water for 10 days; turn it off for 3 days; admit it for 6; turn it off for 2 days; admit it again for 8 days; turn it off for 2.

February 1st, admit the water upon the field for 10 days; turn it off for 6; admit it for 8 days; turn it off for 4; and (such is the minuteness of these instructions) if it be leap year, turn it off for 5 days.

During the month of March, if the weather is mild, the water should be admitted upon the field for 4 days, and turned off for 2 days, alternately. If the weather is cold, the alternation should be, 6 days on and two days off.

During the month of April, the alternation should be 3 days on, and 2 days off.

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\*. The philosophy of this part of the regulation (a matter not unworthy of the attention of agriculturists) probably is, that, as is well known, in the process of freezing, the gases with which water is impregnated, and particularly the carbonic acid gas, which is so conducive to vegetation, are completely expelled. "Snow water, when newly melted, is destitute of all gaseous bodies." Thomson ubi supra.



## CHAPTER XIII.

## EMBANKMENTS.

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IN a county like Stirlingshire, swept and intersected by so many large rivers, and bounded for several miles by the Firth of Forth, the subject of *embankments* must necessarily appear to be of considerable importance.

The embankments which have been practised in this county may be described under two sections; 1. Embankments against the sea. 2. Embankment of rivers.

## SECT. I.—EMBANKMENTS AGAINST THE SEA.

In describing the soils of Stirlingshire\*, it was particularly remarked, that the whole tract of carse land, which

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\* Ch. i, sect. 4.

which stretches along the Forth, appears evidently to have been covered, at some remote period, with the waters of the sea; which, gradually retiring, have left this soil, the richest in Scotland, exposed, and fit for the operations of agriculture. These carse lands are very little elevated above flood mark; and all along the coast, the firth is so shallow, that, at low water, many hundreds of acres are left dry, the soil of which, when recovered from the sea by embankments, is equally valuable with that which had been long under cultivation.

The idea of recovering this fertile soil from the sea by embankments seems to have been originally suggested by a Dutchman about the beginning of the last century. In the adjacent parish of Borrowstownness, "He proposed \* to acquire, by this method, a tract of 2000 acres, upon condition of his being allowed the possession of it for forty years, and the timber of the wood of Kinneil for materials for erecting the dykes: the proposal was rejected." In the Statistical account of the same parish †, a similar account of this proposal is given, with the difference only, that "it was made by a Dutch company, and for a lease of 99 years." Had this proposal been accepted, it is evident that, at the current rent for which such lands are now let, the proprietor might enjoy, at this day, an additional income of L.10,000 a-year.

The proprietors of the adjacent shores in Stirlingshire have at length awakened to a just sense of their in-

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\* See Nimmo's History of Stirlingshire, p. 494.

† Vol. xviii. p. 443.

terest in this important species of improvement. A considerable deal has been done in embanking; but more yet remains to be done in the parishes of St Ninians, Airth, Bothkennar, and Falkirk.

In speaking of the soils \*, some account was given of the progress made in embankments in this district; the subject was there improperly anticipated. The reader, it is hoped, will now forgive the introduction of the detail in its proper place.

The number of acres of carse soil, lately recovered from the Firth of Forth in Stirlingshire, is, as far as the Reporter has been able to ascertain, as follows: viz.

	<i>Acres.</i>
In 1788, by Lord Dundas	90
In 1806, by the same	24
In 1809, employed in reclaiming	60
Within these 40 years, by the Earl of Dunmore	120
About to be reclaimed, upon the same property	50
Reclaimed by Mr Graham of Airth	70
————— by Mr Ogilvie of Gairdoch	70
————— by Mr Gilmour	30
	<hr/>
	<i>Acres, 514</i>

Thus it appears that, within these few years, there have been recovered, or are in the course of being recovered by embankments against the sea, no less than 514 acres of the richest soil in Scotland,—land which will let at five guineas per acre.

*It*

It may be permitted to add, that on Lord Dundas's estate 500 acres more of the same value may be easily reclaimed in the same manner. An intelligent friend assures the Reporter, "On the authority of a respectable undertaker, that the expence would not exceed "L.20 per acre;" thus the whole expence would amount to about L.10,000; and the return, at the ordinary rent of L.5 per acre, would be L.2,500 a-year, or about four years purchase of the soil; 200 acres more of the same quality might be recovered in that neighbourhood at a similar expence.

Besides the private emolument which would accrue to individuals from the spirited prosecution of these embankments, a very important public benefit would also arise; were they completed, to the extent of which they are capable, the navigation of the Forth and Carron would be greatly improved; the waters of the Firth, which are now spread over a large surface, would be confined within a narrower channel; and the depth would be so much increased at full tide as to admit vessels of a large burden.

Wherever, on the other hand, these embankments are neglected, the sea is gradually gaining upon the land, and washing off the most valuable soil; a striking instance of which was observed to the north of the confluence of the Carron.

But there is reason to hope that many years will not be allowed to pass till, on the adjacent shores of Stirlingshire and Linlithgowshire, there shall be added at least 3000 acres to the carse soil of Scotland. The Duke of Hamilton is said to be very active in recovering this valuable soil on his estate of Kinneil.

With regard to the manner in which these embankments are constructed, the Reporter finds that a year or more before the bank is built, facines of brushwood are fixed down in the clay, by strong palisades, in the line in which the embankment is to be conducted; and over which it is afterwards actually built. By this line of facines, the mud and floating vegetables, which would otherwise be washed away, are arrested, and a considerable addition made to the soil.

The embankment is made of mud or earth, faced, on the side that presents itself to the sea, with large stones, which are procured from the quarry of Longannat, on the opposite side of the firth. The strongest of these embankments are 40 feet wide at the bottom, and 12 feet high, having a slope of two feet to every foot in height. In some situations, a bank of 7 or 8 feet in height is found to be sufficient. A dyke of this kind will defend from the sea for ages; and is kept in repair at an expence so trifling that tenants have no objection to take the burden upon themselves.

#### SECT. II.—THE EMBANKMENT OF RIVERS.

THE only instance of embankment on the Carron, which seems to merit attention, occurs towards its confluence with the Forth. There it formerly straggled, in various windings, through the rich carse land that stretches along the coast; and its ancient banks may still

still be traced through the fertile arable fields. Lord Dundas, with patriotic spirit, straightened the course of the Carron towards its *emboucheure*, many years ago, and defended it by suitable embankments entirely at his own expence. On the tongue of land included by the Carron on the north, and by the grand canal upon the south, stands the flourishing seaport town of Grangemouth.

The embankments on the Kelvin, in the parishes of Kilsyth and Baldernock, furnish the most extensive and important example of this species of improvement that occurs in this county.

In the parish of Kilsyth, this river has its course for upwards of four miles, over a plain of small declivity, and of a soft loamy soil. It formerly straggled in many directions over this plain, in a channel of very little depth; at every turn which it took it was gorged up into a pool, and was overgrown with aquatic vegetables. At every flood, the whole valley presented the appearance of a lake; the hay and corn harvests were frequently ruined; and several fields, naturally of a rich soil, were rendered incapable of cultivation.

About the year 1793, the late Sir Archibald Edmonstone of Duntreath, Bart. who was proprietor of the lands on the north side of the river for more than four miles, employed Mr Robert Whitworth, the celebrated engineer, to form the plan of a new cut, sufficient at all times to contain the waters of the river, and as nearly in a straight line as the situation of the grounds and the course of the river would admit. To induce the proprietors on the south side to join in this useful undertaking, he generously offered to lay out two

thirds of the expence himself. So slow; however, are persons of unenlightened minds in discerning their own interests, that only a few of them, at that period, acceded to these advantageous terms. During the first year, only about a mile and three quarters of the new cut was executed. But the advantages of this partial improvement soon became so obvious, that the greatest part of the conterminous heritors concurred with Sir Archibald in prosecuting the plan, though not altogether upon such liberal terms as a just sense of their own interest might have dictated. Early in the course of the second year the cut was completed in the parish of Kilsyth.

The dimensions of this cut are varied judiciously, according to the gradual increment which the river receives in its course. For the *first* mile from above, where the river is of inconsiderable extent, it is from 18 to 20 feet wide at the surface, by 10 to 12 at the bottom. Throughout the *second* mile it is from 22 to 24 feet wide at the surface by 14 to 16 at the bottom. Throughout the remaining part it is about 28 feet at the surface by 16 to 18 at the bottom.

The first part of this cut was undertaken by the contractor at twopence per cubic yard, but he was only bound to lay down the earth regularly at the distance of a yard from the edge of the cut, without any obligation to form it into a regular sloping bank. It was understood that the conterminous heritors would execute this part of the operation. As they, however, proved negligent in this respect, it was found necessary to enlarge the contract; and twopence farthing per cubic yard were allowed for cutting, and for forming the bank.

bank. The low rate at which this contract was entered into may be accounted for at this day,—not merely from the facility of working in a rich loam or clay, but chiefly from the well known, and, by many severely felt, depreciation of money from that period. Such a work would not probably be now undertaken for less than fourpence per cubic yard. The expence of the whole of this cut, through Kilsyth, did not exceed L.600.

The embankment on the sides of the cut is erected about three feet from the brink, and is, for the most part, somewhat more than three feet in height. It may afterwards be raised, should it be found necessary, a foot or two higher, leaving a water course of between 30 and 40 feet, which would contain nearly double the quantity of water that now runs.

It may be proper to add, that whilst these public spirited operations of Sir Archibald Edmonstone, and of his son Sir Charles, who has prosecuted these improvements with redoubled vigour, were thwarted in no small degree by some neighbouring heritors, who are now highly benefited by their enlightened exertions; some compensation was afforded by the liberal concurrence of a respectable heritor situated farther down upon the river, the late Mr Lennox of Antermoney. That gentleman, sensible of the benefits that had arisen from straightening and embanking the river in the district immediately above, and fettered by no prejudices of the conterminous heritors, conducted the operation through his estate upon an improved plan. The cut upon this estate is beautiful, and executed in the completest manner; and, whilst it carries off the waters of the Kelvin, furnishes a ready method of draining the



upper grounds. The undertaking and the execution do honour to the memory of the gentleman who conducted it.

This improvement, which has been described, has been productive of very important advantages in this naturally fertile district. The declivity, or fall of the river, throughout this tract, is about 18 feet. The waters which formerly, in their crooked course, were almost wholly stagnated, now run at the ordinary rate of the declivity which is given them. They never overflow their banks. Cattle can now pasture over those grounds in which they would have formerly been swamped. The surface of the water being now, for the most part, four, and sometimes six feet, below that of the adjacent fields, this cut serves as a general drain to the whole valley; so that 300 acres of meadow may be converted into arable land; 60 acres of moss may be converted into meadow; and 500 acres of arable land are already rendered of double value\*.

In the parish of Baldernock, the Kelvin, which there forms the boundary between the counties of Stirling and Dumbarton, is embanked by a more simple process. In that district, it runs through a rich flat plain of about 6 or 700 acres; and often, by its inundations, injures, and even sweeps away, luxuriant crops. About

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\* For this account of the embankments on *that part of the Kelvin*, which runs through Kilsyth, the Reporter is principally indebted to the Statistical Account of that parish, (vol. xviii. p. 220.) and to the valuable communications of James Davidson, Esq. writer to the signet.

30 years ago, the proprietors united in erecting an embankment on each side of the river. This embankment is placed at the distance of four or five feet from the brink of the river. Its height is not above four or five feet. It slopes very gently from the ground,—apparently at an angle of about  $135^{\circ}$ . It is faced with sods or turf with the grassy side outwards. Thus, when the river swells, as it frequently does in this district by the confluence of mountain torrents in the higher parts of the country, the surface of its channel being here greatly enlarged, and one foot at the surface now containing as much as four feet does at the bottom,—the overflowing of the river is, except in cases of unforeseen accident, effectually prevented. It may be observed, in addition, that the sods, or turf, fixed on a slope declined at so wide an angle from the brink of the river, form a far more effectual barrier against the violence of the current than a perpendicular fence of much greater height and strength. The sloping sod allows the stream to glide on gently; and if, at any time, a portion of it is torn up by the torrent, it is an easy and cheap matter to renew it. The newly applied sod should always be fixed down to the soil by wooden pins.

## CHAPTER XIV.

## LIVE STOCK.

## SECT. 1.—CATTLE.

THOUGH some calves are reared upon almost every farm, yet Stirlingshire cannot properly be denominated a *breeding* county. In the rich arable lands in the lower parts of Stirlingshire, the number of cattle which is kept is barely sufficient to supply the family with milk, and is not always adequate to the supply of the butter and cheese which is needed. In the grazing districts, again, as in the uplands of St Ninians, in Fintry, Kilsyth, Campsie, and Strathblane, a much greater proportion of calves is reared, but not so great as to constitute them *breeding* districts strictly speaking. It has been already noticed that in Strathblane, where there are about 260 milch cows, only about *half* that number of calves is reared: the same may be taken as the proportion throughout the rest of the adjacent grazing districts.

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These grazing districts, it may be observed, are chiefly occupied in fattening cattle for the butcher; for which they are admirably calculated by the abundance and the good qualities of the herbage, which has been already described \*. The cattle that are found to fatten best on these pastures, and to afford the most delicious beef, are not those which have been reared upon the spot; but the small highland breed from the Hebrides, and from the mainland of Argyleshire and of Inverness-shire. Stirlingshire, situated in the very opening to these breeding districts, is supplied abundantly, and with the utmost readiness, by dealers or drovers who are constantly passing, during the summer months, with cattle of all ages, to the low country.

These highland cattle are bought in for fattening, in the beginning of summer; and sold for the shambles in the end of autumn. The weight, when fat, runs from 18 to 24 stones Tron,—with from 4 to 5 stones of tallow. The exertions of an individual of this district, the late Mr David Dun, who rented lands entirely employed in grazing, to the amount of L. 1800 a-year, are mentioned with just praise by the author of the Statistical Account of Fintry †: “To his example in the improved mode of grazing which he used, its present advanced state, through a considerable part of the west of Scotland,” seems to be very properly ascribed. “He selected the most choice cattle to stock his farm with; he kept his grass lighter, that is, he put fewer cattle on than had been used in former times.

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\* P. 44.

† Vol. xi. p. 374.

"times. As a specimen of his success, it is stated that  
"he sold a highland stot to a Glasgow butcher, which  
"weighed 52 stones of beef, and 10 stones of tallow.  
"The price he received (this was previous to 1794)  
"was 25 guineas. The same person at another time  
"sold 25 highland stots at L.12 each, the lightest of  
"which weighed 30 stones." Iron weight is always  
understood to be meant.

With regard to the *breed* of milch cows, in this important grazing district, a most laudable attention has been paid of late by the landed proprietors of the parishes of Kilsyth, Campsie, and Strathblane, by establishing an annual competition for premiums for the best bulls and cows; and it is proper in this place to observe that these gentlemen, from experience and observation, have given a decided preference to the Ayrshire breed.

The exertions of this association "for improving the  
"breed of cattle in this district," may be considered in an interesting point of view,—not only as a present incitement to this and other counties, but as an example to posterity, of what has been done by patriotic individuals, and of what may henceforth be done. The following account, copied from the advertisement of the association, it is hoped will not be unacceptable.  
"With a view to improve the breed of milch cows in  
"the country, Sir Charles Edmonstone of Fintona,  
"Mr Lennox of Woodhead, Mr Kincaid of Kincaid,  
"Mr Buchanan of Carbeth, Mr Stirling of Craigbar-  
"net, Mr McFarlane of Kirkton, and some other pro-  
"prietors of land in the parishes of Kilsyth, Campsie,  
"and Strathblane, along with Mr Stirling of Keir, Mr  
"Stirling

" Stirling of Kenmure, and Colonel Hamilton of Bar-  
 " dowie, propose, on Monday the 25th June 1808, at  
 " the New Inn at Kilsyth, to adjudge the prizes which  
 " are afterwards to be distributed to the proprietors of  
 " the *four finest bulls* that shall cover during the ensu-  
 " ing season, within the above mentioned parishes;  
 " and on the estates of Cadder, Kenmure, and Bar-  
 " dowie; and to the proprietors of the *four finest cows*  
 " that can be shown from that district, the following  
 " premiums: viz.

" *Bulls.*

" For the finest and best bull	—	L. 15 15 0
" For the second	—	10 10 0
" For the third	—	6 6 0
" For the fourth	—	4 4 0

" *Cows.*

" For the finest and best cow that can be			
" shown	—	—	L. 4 4 0
" For the second	—	—	3 3 0
" For the third	—	—	2 2 0
" For the fourth	—	—	1 1 0

By the proper emulation which is excited by this  
 competition, the breed of cattle in this district has, as  
 might have been expected, received, within these very  
 few years, a very perceptible amelioration. Mr Archi-  
 bald Edmonstone of Strathblane parish, to whom the  
 Reporter has already acknowledged his obligations for  
 valuable information, has now a bull from Ayrshire,  
 which, in the Kilsyth competition, obtained the first  
 prize

prize for the first year. This bull, being shewn afterwards at Glasgow, against a bull which had obtained the first prize in a Lanarkshire competition, on a bet of 10 guineas to *one*,—carried it. This same bull has now raised a remarkably fine stock in the neighbourhood. It is proper to add that Mr Edmonstone, in order still further to improve the breed of cattle on his farm and in his neighbourhood, has been in the practice, for several years past, of buying in annually a parcel of queys of one year old from Ayrshire.

Similar premiums for improving the breed of cattle by the introduction of Ayrshire bulls are given by the Gargunnoch club,—of which institution an account will be afterwards offered. The premiums are :

For the best bull	—	—	L. 8	8	0
For the second	—	—	5	5	0
For the third	—	—	3	3	0

It is a condition required in this competition, that the bulls shall be kept within the bounds of the club, till the month of August next ensuing after the prizes have been gained.

With regard to the *form* and *constitution* of the best kinds of cattle, the Reporter does not feel himself qualified to speak. Experience, and long habits of observation suggest, at a single glance, the forms most proper for the purposes of the dairy or of fattening ; and it is wonderful how quickly our drovers and cattle-dealers can distinguish by the eye the nativity, the breed, the age, and the uses of the different varieties of cattle. On this subject the valuable information  
contained

contained in Dr Coventry's pamphlet on *Live Stock* is earnestly recommended to the attention of dealers in cattle. The Ayrshire breed, which is so generally esteemed, is for the most part of a dappled colour, the mixture being a brown, or red, with white.

FOOD.—*In winter* milch cows are generally fed in this county with hay or oat straw, together with two feeds every day of boiled chaff,—turnips, potatoes, or cabbages: where the refuse of distilleries can be obtained, it is used with advantage.

With regard to the cattle that lie out of doors through the season, and which are here called *winterers*, they are chiefly of the highland breed, bought in at the end of autumn, and fed during the winter for the May and June markets, when they are sold for fattening on the rich pastures of England, or in the feeding districts of Scotland. The *wintering* of cattle is principally practised in the western parts of this county; in Buchanan, Drymen, Fintry, Strathblane, Campsie, Kilsyth, and the higher grounds of St Ninians. Situations which afford the shelter of woods, or of deep ravines and vallies, are the most favourable. Until the rigours of winter set in, which is for the most part from the 10th to the 25th of December, the cattle are left to provide for themselves, by what they can pick up in the fields, or what is here termed the *foggage*. After that period they are fed every evening and morning with straw, or with bog hay, scattered about in proper proportions by the hand. It is remarked that the coarsest natural grasses afford the heartiest bite to winterers. The *juncus articulatus*, or spret, which grows  
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in vast abundance on the Fintry and Campsie Fells, is, as was formerly noticed, made into hay, and much used for this purpose.

The return produced by the wintering of cattle varies, according to the state of markets, from one to two pounds Sterling per head.

Much cattle is also fed for the butcher in straw-yards, and stalls, and sheds, and at distilleries, during the winter. Their principal food is turnips and potatoes, with the occasional addition of straw and hay. In feeding for the butcher, it is of great importance to keep the cattle warm and well littered, and to expose them to the least possible exertion and fatigue; and it is probably upon this principle of not disturbing their repose, that it is recommended to keep cattle that are in the course of fattening in the dark.

It is hoped that it may not be deemed impertinent to the subject to notice in this place, that during the suppression of the distillation from grain, the want of that regular supply of fresh animal food which had been formerly afforded by the distilleries was severely felt in the eastern district of this county, not merely with respect to the *quality*, but chiefly with respect to the *quantity* of butcher meat that was exhibited during the winter months in the markets of Falkirk and Stirling. In the years 1809 and 1810, on account of the small supply which these markets afforded, a greater quantity of beef was salted for winter store in that neighbourhood than had been done for many years before. Thus, if a famine in grain was by that measure prevented, a proportional deficiency in animal food was, at the same time, occasioned; and it came  
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to be a question, whether a scanty supply of barley cakes, or of the more nutritive aliment of beef and mutton, and pork, were most severely felt by the hard labouring peasant.

*In summer*, cattle that are intended for the shambles lie out day and night in the rich feeding grounds of this county. Milch cows are generally kept within doors, not only during the night, but also during the heat of the day, in summer. They are fed in the house with cut clover, tares, or the outer leaves of cabbages and colewort. In some places a more improved method of managing milch cows is adopted. They are allowed to lie in the fields the whole night, and kept within doors; where they are fed by soiling, during the heat of the day. By this method, they enjoy the cool and free air, and have an opportunity of pasturing in the morning as soon as it is light, whilst they are freed, through the day, from the excessive heats, and from the annoyance of insects.

*Salt* is little employed in this district in feeding cattle, though it is certain that its use would prove of great advantage. We observe that saline substances are eagerly sought after by cows; they will greedily devour the refuse of straw left by horses, which has been trodden under their feet, and drenched with their urine. There seems to be something in the state of their stomachs that requires the stimulus of the volatile alkali contained in this refuse.

*Worked Oxen compared with Horses.*

As no instance of working by oxen has fallen under the Reporter's observation in this county, it appears altogether unnecessary to enlarge upon the subject.

Much has been said and written on the comparative use of horses and oxen in husbandry. Horses, it is argued, perform their work more expeditiously than oxen; they require shorter intervals of rest than oxen, which must have a long time allowed them to ruminate their food before they are put to work again; and the hoofs of horses admit of a more effectual defence against the flinty hardness of our improved roads than those of oxen.

On the other hand, horses are very high priced compared with oxen; they arrive at their most perfect state at the age of five years; from that period they decline every year in value; and in the end, they are worth only the price of the hide: add to all this, that the expence of feeding a horse through the year is near four times as much as that of feeding an ox.

With regard to the ox, he performs his work slowly; but the Reporter has met with a newspaper account of the work performed by oxen, which deserves to be recorded. It is stated, "That at a ploughing-match which took place at Petworth in Sussex, the ploughman finished an acre with two oxen, without a driver, in five hours and 56 minutes; the furrows being from five to seven inches deep \*." The ox is fit for labour

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\* Sun of London, 30th Nov. 1797.

labour at two years of age ; and, at five years, he is of more value than when he was first yoked ; he may be wrought with advantage from the age of four to that of ten years ; but the principal advantage is, that during the whole period of working, his size increases by proper feeding ; and his final value in beef and tallow is as great as if he had never been wrought.

In point of theory, then, every argument seems to be in favour of the use of the ox in husbandry. In point of practice, the very reverse appears to have taken place. About half a century ago, the use of oxen prevailed much in Stirlingshire ; that it is now entirely laid aside seems evidently to imply some fallacy in the theory : and practice, upon so extensive a scale, must be allowed to rest, at least upon a plausible foundation. The probable reason of the practice is, that a certain number of horses being found indispensable on every farm, for the purposes of travelling, and other operations for which oxen are unfit, it has been found too expensive to maintain the double establishment of horses and oxen.

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SECT. II.—SHEEP.

A VERY large portion of the uplands of Stirlingshire is occupied, as has been stated\*, in pasturing sheep.

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\* P. 196.

In this section, the Reporter does not pretend to offer a complete detail of the economy of sheep farming in this county. He must satisfy himself with giving some miscellaneous information which he has obtained from the most authentic sources.

The breed that is almost universally used is the *black-faced* or *muir* breed, also called the *Linton* breed. An enterprising farmer of Mr Johnstone's of Alva, from Roxburghshire, whose lease had been lately renewed, in 1809 introduced the Cheviot breed, the wool of which is of a very superior quality; he entertains great hopes of success in the fine sheep walks of the Ochills; but the experiment is too recent to warrant, as yet, any certain conclusion.

Mr Edmonstone of Spittal, in Strathblane parish, states, "That some time ago he made a trial of Cheviot and Spanish ewes, which he kept on his farm for several years; but he found that they did not pay so well as the black-faced; their wool was, no doubt, twice the value of that of the common breed; but they had not so much of it by a third. Two of the black-faced lambs were as good as three of the Cheviot; and in a severe winter, or bad lambing season, there was a double loss of the latter; that, in short, he gave them up, convinced that the black-faced kind is better fitted for the soil and climate, being both better breeders and better feeders than the Cheviot."

With regard to the *food* of sheep in this county, almost no instance occurs where they receive any by the hand. In summer they feed up to the very summit of our highest mountains: when the rigours of winter

winter set in, they are brought down to the low grounds, the pasture of which had been saved through the autumn for their use.

Sheep are not folded through the night, for many years past. In the vicinity of the farmer's dwelling there is a *pen*, here called a *fank*, erected, of stone and turf, in which the sheep are enclosed only at the four great *gatherings* which take place in the year, and of which mention will afterwards be made.

The Reporter offers the following miscellaneous observations on the economy of a sheep farm, upon the authority of an extensive occupant of sheep pastures in the western district of this county \*.

The stock of a sheep farm may consist of *ewes* only, or of *wedders*; or, partly of the one and partly of the other.

#### 1. *Of an Ewe Stock.*

Suppose the stock to consist of 1000 ewes, to every 30 ewes one ram is necessary. The number of lambs produced by such a stock varies from 700 to 900. To keep up this stock, 200 of the best lambs must be added to it annually, and 10 of the best tup lambs to supply the place of 10 of the worst tups or rams, which are to be sold off when four years old.

The remainder of the lambs, together with 100 old ewes, are to be sold off to make up the rent. The ewes

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\* Mr Duncan Graham, Brachoru-morc.

are sold to the butcher between the age of three and seven years. None are kept beyond this last age.

The greater proportion of lambs annually kept above that of ewes sold, is necessary in order to supply losses sustained by diseases and other casualties. These lambs are not allowed to approach the tup till they are 18 months old.

The rent of a sheep being estimated in this district at 4s. the rent of a farm that maintains a stock of 1000 ewes will be £.200. It is evident that no rent should be added in this estimate for the 210 lambs annually added, till they are at least a year and a half old, as they produce nothing till that period.

In favourable situations, that is, in sheep pastures which are not very mountainous and rocky, and where a large space of ground can be taken in at once by the eye, one shepherd is able to manage 1000 sheep; in unfavourable situations, he cannot manage above one half of that number.

It is necessary to collect the whole flock at the *pen* or *fank* at least four times in the year, for the following purposes; viz. first, to cut the lambs where a wether stock is kept; this is generally done early in June. 2 To clip or shear the wool, early in July 3. To take the lambs off from the sheep in order to wean them, which is done about the 20th of August. 4. To pick out the old ewes that are to be sold about Martinmas.

In order that the lambs may drop at a suitable season of the year and of the weather, the tups are separated from the ewes about the 11th of October; and kept in inclosures in the low grounds constructed for that purpose. They are admitted to the ewes about  
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the 26th of November. The ewe goes with lamb 21 weeks.

It was, till of late, the almost universal practice to *lay* or *smear* the whole stock with an ointment composed of butter and tar; this was done in the end of October and beginning of November. This served several important purposes: it preserved the wool upon the body, it prevented vermin, and it afforded protection against the severities of the ensuing winter.

Every farmer would wish to continue this practice of smearing his whole stock; but the price of tar has lately become so high, on account of the interruption of our trade with the northern states, that the expence cannot be encountered on a large scale. Smearing is now seldom used except for the year old lambs, or *hogs* as they are called, and for the tups. The older part of the stock are generally *washed* with tobacco juice, to which that of broom is sometimes added. This is found equally effectual with smearing, for the purpose of destroying vermin, but not for defending the animal from cold. Tobacco juice is also found to be the most effectual cure for the scab in sheep. This washing is performed in December. The expence of *smearing* with butter and tar in 1810 was 6d. per sheep; that of *washing* with tobacco juice 2d.

The wool of sheep that have undergone the operation of *smearing* is called *dun* wool, in opposition to that of sheep which have not been smeared, which is called *white* wool. The *dun* wool generally sells 2s. or 2s. 6d. below the white. It requires much purification, but is equally valuable with the white for all kinds of cloth that is to be dyed. In 1810 white wool sold at



11s. per stone, and dun wool at 9s. Seven fleeces of the former generally make a stone, and four or five of the latter.

## 2. *Of a Wedder Stock.*

Wedder mutton is much more esteemed than ewe; it is well known that all animals designed for the food of man are improved in the delicacy and flavour of their flesh by castration. Wedder mutton brings from a penny to twopence per pound more in the market than ewe mutton.

A wedder stock is kept on many sheep farms of this county. If it is kept on the same farm with an ewe stock, they must be kept completely separated from one another, for various reasons; but chiefly because the wedders, being the strongest, agitate and toss about the ewes when feeble and heavy with lamb, so as to do them much injury. Besides, the wedder stock being intended for the market, in order to fatten them properly, they must be placed upon the richest pasture that the farm affords.

As the stock of a sheep farm generally consists partly of ewes, and partly of wedders, let us suppose a farm capable of maintaining 2000 sheep, and that the wedder stock constitutes one half. Eight hundred lambs, at an average, as already stated, are annually produced. One half of these are generally males. All of these are cut in the beginning of June, and added to the wedder stock; few of them die under the operation. It is remarked, however, that more of the wedder lambs than

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of the ewes are carried off by the disease called the *braxy*, of which notice will afterwards be taken. From this circumstance, though 400 are annually added to the wedder stock, the farm can send only about 300 widders to the market. On the highland pastures, it is observed that a wedder gets worse after the age of three years. They are accordingly disposed of to the butcher at that age.

Some farmers of this district do not rear widders of their own stock. They buy them in at the age of two years, and sell them off at that of three. On such a plan there can be very little loss. The only inconvenience is the difficulty of keeping them on the farm at that age. They are continually attempting to get off to their native soil.

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It only remains to add a few observations with regard to the *distempers* to which sheep are liable.

1. The first and the most formidable of these is the disease here denominated the *braxy*. It chiefly attacks lambs and young sheep. Very few die of this disease after the age of 18 months. It is remarked that the fattest and best conditioned of the flock are those which are most generally carried off by it. It is reckoned, that on some farms, four lambs out of twenty die of this disease. There have been instances where the one half of the whole has perished by it.

Of

Of the cause and nature of this disease, the Reporter has never met with an account that fully satisfied him. It makes its appearance on some farms earlier in the winter than on others, according to circumstances. On wet, spouty pastures, it commences from the first setting in of winter. On dry, elevated soils, it sometimes does not appear till about new year's day ; and as the winter advances, it again gradually disappears. The progress of the disease is extremely rapid. Its attack begins through the course of the night, and the animal is generally found dead or expiring in the morning. It seldom survives till the middle of the day. The whole body is found bloated and swelled ; the bladder burst, and the urine diffused through the intestines. The flesh becomes black, and the whole carcase foetid.

Were it permitted to offer a conjecture with regard to the cause of this ruinous disease, it might be suggested that it is probably occasioned by a sudden interruption of the perspiration. Its attacks commence for the most part in the early part of the winter, when the days are yet of considerable length, and the sun for a long while above the horizon. The animal, not yet braced against the colds of winter, had been basking through the day in the sun, and perhaps heated with exercise ; it lies down at night in this condition on the damp ground : before day it becomes benumbed by the hoar frosts ; perspiration is suspended ; the valves of the urinary duct are paralyzed ; the bladder bursts, and the creature dies.

This view of the subject was originally suggested to the Reporter by a practice which has been observed for many years by Malcolm Macfarlane, who has long occupied

cupied a considerable sheep farm on the estate of Duchray, the property of General Graham Stirling. It is this; every morning, a considerable time before daylight, during the early part of the winter, (the period when the braxy prevails) he, or some of his people, visit the flock on the spot where they are resting; he rouses them from their sleep, and agitates and drives them about for a long time with his dogs. By this process, the animal heat is again excited, the perspiration restored, and the tone of the urinary passages renewed. It is certain that on this farm the depredations of the braxy are very inconsiderable, or even scarcely known. The suggestion of this practice will surely be allowed to merit the serious consideration of sheep farmers; and should it be found as effectual in other situations as on this farm, Malcolm Macfarlane will merit the gratitude of his country.

There is a distemper called the *fly* in sheep, which has been known in this country only within these very few years; but which has, of late, become very general. It appears to be occasioned by the deposition of the eggs of some species of fly (probably not indigenous to Scotland) under the scarf skin of the animal; these soon become maggots, and devour the flesh miserably, occasioning a loathsome ulcer, which enlarges rapidly, and if not cured, kills the creature in the space of six days. It is said that this distemper has prevailed in England for about ten years. In tracing its progress, it appears to have travelled, and to be still travelling *northwards*, encroaching every year upon one district after another, in that direction. It was observed in the very western extremity of this county for the first time only  
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in 1808. It is as yet unknown in Lochaber, and in the north; but it seems to be advancing with rapid strides.

The principal cure which has hitherto been applied with any effect, is to cut off the wool carefully about the ulcer, and to anoint it with tar. This application must be made at an early period of the disease.

#### SECT. III.—HORSES.

ON the subject of horses nothing occurs peculiar to Stirlingshire. Very few horses are bred within the bounds of the county. Riding and carriage horses are generally procured at high prices from England; draught horses chiefly from the counties of Lanark and Ayr. The price of work horses varies extremely; they cost from L.18 to L.45. Two horses are reckoned sufficient to labour a farm of 35 acres arable. A good horse will draw from 15 to 20 hundred weight, and sometimes more.

With regard to the food of work horses, no accurate estimate can be offered, as the farmer generally maintains them through the winter on straw and the offals of his grain; in the spring, on hay, with oats or beans, in the time of working; and in summer on cut clover. In the carse the horses feed much through the winter on bean straw, which is reckoned much heartier than the straw of oats or barley.

Potatoes, either raw or steamed, have of late years been much used in feeding horses; and perhaps it is  
one

one of the most important improvements that could be adopted in this respect. A horse will eat as many potatoes as will maintain him in good condition, in one-tenth part of the time that he will eat as much hay as will be necessary for that purpose; he will therefore be sooner ready for returning to his work. The succulency of this food will preserve his body open, and keep his skin and hair sleek. With the potatoes, he must have a certain proportion of oats and hay to prevent flatulency.

All grain given to horses should be previously broken or bruised between rollers, by which much waste will be prevented; and if the grain were malted before it is given to them, a great advantage would arise from the superior degree of nutrition afforded by the saccharine matter. In this view it may be added, that, did the relative prices of barley and of oats allow it, the former would furnish a more nutritive food for horses than the latter, as containing much more farinaceous matter. Carrots have also been lately introduced with great advantage as a food for horses.

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SECT. IV. & V.—ASSES AND MULES.

OF the uses of these animals in agriculture, the Reporter has met with no instance in Stirlingshire.

SECT.

## SECT. VI.—HOGS.

THE introduction of swine into this district is of recent date, and is not as yet universal. The people in general, and highlanders in particular, have an aversion founded on very ancient prejudices, against the flesh of swine. This prejudice, however, is rapidly wearing out. Though swine are not reared upon a large scale, yet for some years past almost every family, and even those of cottagers, feed a sow or two for their own use. It was only at the distilleries, previous to the suspension of the use of grain, that swine were fed to any considerable extent.

The breed which is most generally esteemed is the Chinese, which was imported directly from China by some public-spirited gentlemen connected with this county, and commanding East India ships. The advantages of this breed are stated to be, that they are easily fed, that they produce the best sucking pigs, and pork and bacon of the finest quality and flavour. At the distilleries, the large Hampshire breed was chiefly used. A cross breed betwixt this and the Chinese is held in great repute.

Swine feed on all kinds of vegetable offals. Cut clover is sufficient to maintain them through the summer, with the addition of what whey and butter-milk can be spared. Potatoes, especially, form an acceptable  
and

and nutritive food. When they are to be fattened for the butcher, after they have been fed for six or eight weeks on potatoes, it is necessary, in order to render their flesh firm and fit for salting, to feed them partly with oats or beans well dried, and it would be of great advantage to have them bruised or broken. Swine, when killed, are almost never skinned, but have the hair taken off by scalding with boiling water. In this practice there is evidently much loss. The skin of a well grown sow brings a high price, and is valuable for many purposes, particularly for saddlery. Why should it not be taken off as from other animals slaughtered for food? The pork or bacon would not suffer by it.

The only distemper of swine which has fallen under the Reporter's observation is the fly, similar in its progress and effects to that which has been described as affecting sheep. It is to be cured in the same manner by anointing with tar.

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SECT. VII—DEER AND GOATS.

THE Reporter hopes that he will be forgiven for substituting a few remarks on *deer* and *goats*, (some of which species of live stock still exist in this county) in the place of those which he is called upon by *the plan of the Board*, to offer on the subject of *rabbits*, none  
of



of which have fallen under his observation in Stirlingshire.

1. DEER.—The island of Inchmurrin, in Lochlomon, the property of his Grace the Duke of Montrose, extending about two miles in length by one in breadth, finely wooded, and affording excellent pasture, has been for more than a century past well stocked with fallow-deer. The stock of deer of all ages upon this delightful island, amounts to about 240, and furnishes venison distinguished by its admirable flavour. On the island there is a neat hunting seat and offices, built by the Duke in 1793, where his game-keeper is situated with his family. Every attention is paid to supply the deer with hay for their winter feeding. The climate is mild, from the little elevation of the lake above the level of the sea, and the woods afford shelter from every blast that blows. The stock is, on these accounts, in a very thriving condition.

2. GOATS abounded within less than half a century, on Benlomond, and in the upper parts of Buchanan. A considerable portion of the rents was paid, at that period, in kids, and in goat-milk cheese. The flesh of the kid is delicate, savouring somewhat like venison. Goat-milk cheese, which could be obtained in this quarter within these 20 years, is particularly fine flavoured; it resembles Parmesan. It is within the memory of the Reporter when the flock of goats was regularly brought to the pen every evening and milked for a certain period during the summer. Goat milk, and goat-milk whey, were in those days esteemed a cure for many disorders

disorders of the constitution; and it was as common for ailing people to repair to goat-whey quarters in the highlands, as it is at present to go to sea bathing.

The goat is a picturesque animal: its tapering horns, its flowing beard, and the agility of its gait appear striking to a stranger. Its bad qualities, however, preponderate. It is less useful than the sheep in many respects. It is particularly injurious to oak coppice woods, which are at present of such value: it crops the tender shoots, and peels off the bark. The proprietor of oak coppice, therefore, permits no goats to be kept upon his estate. They are now almost entirely exterminated in this district. In the barony of Duchray, in Drymen parish, about 40 goats may still be found. A few stragglers yet remain, in a wild state, upon the out-skirts of Benlomond. In the parish of Logie, on the rugged precipices of the Ochills, where no oak woods occur, some goats are still to be met with; and thither some invalids still resort for the use of goat-milk and goat-milk whey.

#### SECTION VIII.—POULTRY.

POULTRY of various kinds are bred in considerable numbers in this county. On many estates, as has been noticed already, kain fowls are paid in part of rent, a most pernicious burden to the tenant, and little profitable to the landlord. The former often prefers buy-

ing the fowls in the market to the rearing of them on his farm : and the latter receives the poorest and leanest fowls that can be had.

Cottagers rear dunghill fowls to bring them and their eggs to market. Carriers and small dealers abound in every district, who are ready to pick them up, and to dispose of them in the adjacent towns and villages.

Turkies, geese, and ducks, are also reared, principally about gentlemen's seats, and on large farms. In rearing all these kinds of poultry, there is more of family accommodation than of real profit.

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#### SECTION IX.—PIGEONS.

PIGEONS, being extremely voracious, have, from a very early period, been considered as a nuisance to the farmer in Scotland ; and certain laws have been passed to restrict the multiplication of them. By an act 1617, ch. 19. proprietors are discharged from building dove cotes, unless their yearly rent, lying within two miles thereof, extend to ten chalders of victual. A purchaser of lands, with a dove cote, is not obliged to pull it down, though he should not be qualified to build one in the terms of the act ; but if it becomes ruinous, he cannot rebuild it\*.

Pigeons

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\* Erskine's Principles of the Law of Scotland, b. ii. tit. 6. sec. 2.

Pigeons are particularly destructive during the seed time; and, in the harvest, after the corns are reaped, and put up in shocks. They do little injury while the corns are standing.

It has been suggested that the pigeons of the carses of Stirlingshire are of a larger size than in other districts, probably from the idea of the superior quality and quantity of their food. The Reporter, after the most minute enquiry, has not found that there is any difference.

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#### SECTION X.—BEES.

Bees are bred in Stirlingshire, but not on a considerable scale. The western district of the county, where heath and wild flowers abound, seems the most proper for them. They are chiefly bred by cottagers, and small occupants. The minute attention which they require, especially about the period of swarming, is incompatible with the labours of the farmer. The profit arising from bees is very precarious, and depends much upon the state of the seasons. A district may be overstocked with bees, as well as with any other species of live stock. They derive their wax from the *farina*, and their honey from the *nectaria* of flowers: if there is an insufficiency of these, the bees must perish. A restriction on the number of hives to be maintained in every district would seem highly reasonable.

## CHAPTER XV.

## RURAL ECONOMY.

## SECTION I.—LABOUR.

THE *labour* of a farm is performed either by servants hired by the year, or half year, or by labourers hired by the day. Under this last class may be included mechanics occasionally employed about a farm, and persons who labour by piece work.

1. *Hired servants.*—Men and women servants are generally hired by the year: this is the interest of the farmer, as it must prove very inconvenient for him to make frequent changes in the hands which he employs. Servants, on the other hand, feeling a spirit of independence from the increasing demand for their labour, and the high wages they receive, and, at the same time, anxious to abridge the period of their bondage, prefer, for the most part, an engagement for the half year. The periods of service are generally from old Martinmas

Martinmas to old Whitsunday; and from old Whitsunday to old Martinmas.

There is little variation in the wages of servants during the winter and summer half years; there is sometimes, however, an advance during the latter period.

In 1810, in the Kilryth district, the wages were as follows by the year:

A married man servant, L.34 with a house.

Unmarried do. from L.26 to L.28, with bed, board, and washing.

Women servants, from L.6 to L.10, with bed, board, and washing.

Through the eastern district of the county the same rate of wages obtains.

On the northern side of the Lennox-hills, and to the westward of Stirling, the rate of wages is as follows:

A ploughman, living in the family, from L.18 to L.24 a year.

A woman servant from L.6 to L.9.

On the sheep farms, in the highland district of this country, a good shepherd, living in the family, receives L.20 a year. A married shepherd, living out of the family (as is most generally the case) has a house, two cows grass, with liberty to rear a quey till it is two years old, grass for forty ewes, potatoe ground, and six bolls and a half of oat meal.

A distinction has been made, in this account, between married and unmarried men servants; the former being, in many situations, particularly in pasturing districts, preferred to the latter. The married manservant, accommodated with a house and garden, and a cow's grass, becomes attached to the spot, and disposed to be stationary; much trouble is also saved to his master's family in respect of his accommodation and maintenance; he will be contented in his own house with such cheer as he would spurn at in his master's kitchen. On the other hand, it may be argued that a married servant may be tempted to neglect his master's interest in order to attend to his own;—if he is dishonest, he has many opportunities of defrauding his master. An instance occurred lately to the Reporter of a shepherd who took especial care, every day, to place *his own forty ewes* on the best pasture of the mountain, whilst he left his master's sheep to shift for themselves on inferior grass.

Many young men and women of this county decline to engage themselves at the Whitsunday term, in the prospect of earning equal wages, with more liberty, by occasional work, and especially by a *harvest fee*. In the western parts of the county many persons of both sexes find employment, during the early part of the summer, in the oak coppice woods, which are annually cut down. There they either take a small lot, each for themselves, to be cut down and peeled, or they engage with those who occupy a lot of wood by day's wages; the occupiers of lots are paid by the bolls of bark which they produce; for a boll of bark, the person who cuts and peels receives from 2s. to 4s. By the

the month of August, these young people are ready to engage for harvest work; and their wages vary every year according to the urgency of the season, or the expected price of victual. Men receive for harvest work from L.2 to L.4; women from L.1. 10s. to L.3. Their engagement is either for a certain number of weeks, or until the whole crop is cut down, whenever that may be.

**2. Labourers.**—Day labourers receive in summer,

With victuals, from 1s. 6d. to 2s. per day.

Without victuals, — 2 6

In winter, with victuals, — 1 0 to 1 6

Masons and wrights receive

With victuals, — 2 0 to 2 6

Without victuals — 3 0 to 3 6

With regard to the hours of work, they are not rigidly attended to by servants in the upper districts of the county, or in situations remote from towns and villages. Servants work there from six o'clock A. M. during the whole season till it is dusk. The women servants, after having wrought in the field, during the day, perform the necessary work of the house and byre in the evening.

In the eastern districts, and every where in the neighbourhood of towns and manufacturing establishments, men-servants work only from six o'clock A. M. to six o'clock P. M. with an hour for breakfast, and an hour for dinner.

The price of labour and the wages of servants have advanced of late years in an enormous proportion.



The present rates are stated above. It would be an easy matter to state, from the Statistical Account of Scotland, the progressive advance of the price of labour in this county till the present period.

Without swelling this Report by a detail which can be easily obtained, let it suffice to say that, in 1794, the price of labour was nearly as follows :

A man servant, living in the family, by the year,	
from	L.10 to L.12
A woman servant	L.4
A day labourer in summer, with victuals 1s.	

About 40 years before the above period the wages were,

A man servant, by the year	L.2 0 0
A woman servant, by do. from	0 15s. 0 to 16s. 8d.

*Bounties*, as they were called, were then given, consisting of clothes, wool, or flax.

Before the year 1760, tailors and day labourers had 4d. per day with victuals.

In 1783, they received 6d. per day, with victuals.

— 1793, — 10d. with victuals.

About 1760, carpenters and masons had 6d. per day, with victuals.

In 1798 — — — 1s. 2d.\*

In 1810, as has been stated, from 2s. 6d. to 3s. Smiths

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\* Stat. Account, vol. xviii. p. 120 and 342.

Smiths do their work, in almost every instance, by the piece.

In former times, tailors and shoemakers went about and performed their work in the families of their employers. They now, almost universally, remain at home, and do their work by the piece.

The late great advance of the price of labour is evidently to be attributed to the rapid depreciation of money, and to the removal of so many of our young men from the country for the supply of the army and navy. Women are now, upon this account, pretty generally employed to perform out-work, in which men only were formerly engaged. There are few operations of husbandry in which women are not employed at present, excepting those of ploughing and threshing. But even the wages of women have, chiefly upon this account, advanced in a high degree; and if to this we add the abstraction of female labour, by the numerous manufactures with which this county abounds, the cause of the rise of their wages may be easily traced.

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SECT. II.—PRICE OF PROVISIONS.

THE ordinary breakfast of the peasantry, in this county, is porridge, made of oatmeal, well boiled, and stirred about in water till it has assumed the consistency of a pudding. This is eaten with skimmed milk, butter milk, or small beer. During the summer, the labourers,

labourers, besides breakfast, receive bread and milk, or bread and cheese, before going to work in the morning. In the western parts of the county, potatoes bruised or beaten into a pudding, with milk, form the breakfast as well as the supper of the peasantry from September to April or May. For dinner, broth made of barley, or groats, with garden stuffs, and the addition of some animal food, or potatoe soup, as formerly described, are in common use. Sowens, or the jelly of oatmeal, as already described, is generally used for supper. In the beginning of winter, householders, according to their circumstances, lay in a store of salted beef, or mutton, or pork. Herrings, which, during the latter part of the season, are caught in abundance in the Firth, constitute an essential article of food. During the summer, little animal food is used in the families of the peasantry; milk then abounds, and is served up in various forms.

\* With regard to the present prices of provisions, reserving that of grain of every kind for the accompanying table of fiars, it may be remarked that, though the price of animal food has nearly doubled within these twenty years, yet it varies but little from one end of the year to the other. That the price of animal food continues nearly the same through the winter and summer, is to be accounted for by the regular economy which is now so generally introduced in the article of feeding cattle. By stall feeding on turnips and potatoes in winter, and by feeding in grass parks, and by soiling in summer, the markets are regularly supplied at all seasons; and the prices of meat continue, in a great measure, stationary.

stationary. The only deviation from this regularity of price was occasioned by the late suppression of distillation from grain, by which one important source of supply was withdrawn for a time.

*Present Prices.*

Beef from 8½d. to 9d. per lib.  
Mutton, the same.  
Lamb, in general, through the summer, from 6d. to 7d.  
Veal, from 8d. to 10d. according to the season.

The above articles are sold by Troy weight, the pound consisting of 22 oz. Troy.

Pork, about 7d. per lib. of 17½ oz. Troy.

A pair of dunghill fowls	4 6
A turkey	7 0
A goose	5 0
A pair of ducks	3 6
A pair of pigeons	0 10
Eggs per dozen, from 9d. to	0 10
Butter per lib.	1 5
Common cheese, 6s. per stone,	

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SECTION III.—FUEL.

THE extensive peat mosses of this county supply abundance of peat or turf for fuel; and peats are in very

very general use, especially in the western district, from which coal lies at a great distance. The time and labour employed in digging and in preparing pits, however, is very great; and when it is considered, that the season of digging them, which is the month of May, and the beginning of June, interferes materially with some of the most important operations of the farm, it comes to be a doubtful point whether coals will not be found the cheapest fuel, upon the whole, even in the most distant parts of the county.

In the eastern and southern parts of Stirlingshire coals abound; and some account having been given, in the first chapter, of this valuable mineral, it does not appear necessary to resume the subject. Coals cost from 8s. to 10s. per-ton. Where oak coppice is annually cut, the refuse of the wood is sold for fuel, and furnishes a strong and cheerful blaze.

CHAP.

## CHAPTER XVI.

POLITICAL ECONOMY, CIRCUMSTANCES DE-  
PENDENT ON LEGISLATIVE AUTHORITY.

## SECT. 1.—ROADS.

Good roads constitute the foundation of all national improvements, whether in manufactures or in agriculture. In Stirlingshire, the attention which is due to this subject has been paid only of a late date. About sixty years ago, any gentleman, setting out from the western district of this county for Edinburgh, considered it necessary to make his will, and to settle his worldly affairs, previously to his undertaking so hazardous a peregrination. It is little more than twenty years since turnpike roads have been introduced upon a general scale; and the cross or country roads were, till about that period, as many of them still are, in a very wretched condition.

For

For the sake of distinctness, the roads of Stirlingshire may be subdivided into turnpike, country roads, and farm ways.

### 1. *Turnpike.*

When it is considered that no traveller, or owner of heavy carriages, who is duly sensible of the difference, in point of comfort, or of the tear and wear of horse furniture, upon a smooth firm road, compared with that on a broken and rugged road, can possibly grudge the payment of a moderate toll, it may appear wonderful how slowly turnpike roads have found an introduction into this county. One cause, indeed, may be easily assigned why they have not been introduced in particular situations; that is, the general inadequacy of the funds arising from the tolls to defray the expences of the interest of the money laid out originally, together with those of the necessary annual repairs. The price of labour, and the depreciation of money rapidly increasing, render it a matter of very serious consideration to introduce a new turnpike road in any district, in which there is not a certain prospect of an adequate revenue from increasing trade and intercourse.

The only resource which presents itself, and to which recourse must be soon had, if the convenience of good roads, so necessary to a commercial and manufacturing country, is to be maintained, is to increase the rate of the toll to be paid. In Stirlingshire, the almost universal rate for a single horse, at every toll-bar, is three halfpence, and so in proportion for more, and every

every bar must be distant from the nearest adjacent bar six miles\*. There is an instance or two where, from particular circumstances, the rate is twopence. In the western district of the county, it was enacted, by the suggestion of a well meaning heritor, that persons travelling on Sunday should pay double toll. A clergyman, riding on a Sunday morning to assist at a neighbouring communion, has some cause to complain of this regulation. Upon the whole, the period seems not to be far distant when, in order to maintain the roads in a proper condition, the tolls in this county must be raised by at least one-third.

Stirlingshire is now intersected in almost every direction by turnpike roads. It is reckoned, from actual observation, that there are, within the limits of this county, about one hundred and sixteen miles of turnpike road. In the annexed map, these are marked by a double line, with the exception of about *four* miles which escaped the attention of the delineator. The particulars are given with all the correctness that could be obtained below†.

The

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\* In a few instances, in the Campsie and Kilsyth district, the distance is no more than four miles.

*Miles.*

† Turnpike road—from the river Avon to Stirling	17
From Stirling to Kippen	10½
Kippen to Buchlyvie, (deducting 2 miles intervening in Perthshire)	3
	10



The materials for making roads, are in general, abundant, and of the best quality. In the Strathblane and Campsie district, whinstone is to be found every where. In the neighbourhood of Stirling, trap, or an imperfect species of basalt, excellently calculated for forming roads, abounds. From Gargunnoch, westwards, to the junction of this country with Dunbartonshire, through a tract of about 15 miles, the materials are more unfavourable

	<i>Miles</i>
To Catter Bridge near Drymen	8
Turnpike road in Stockie Muir, in Stirlingshire	6
From the great Stirling road to Killearn, by Balfroun	5
From Killearn to Strathblane	6
From Strathblane towards Glasgow, in Stirlingshire	6
From Kippen to Campsie* by Fintry	13½
From Campsie towards Glasgow to the limits of the county	3
From Stirling to the Glasgow road by Denny	9½
From Falkirk road to the limits of the county by the Glasgow road	6½
From the Glasgow road by Kilsyth to the limits of the county	8
Turnpike road west from Denny	1
To the north of the Bridge of Stirling, including the road in the parish of Alva	9½
	<hr/>
	112½

Add to the above 2 miles of turnpike road, leading from the Glasgow road across the Blane to Killearn, together with 2 miles from the

Bridge

favourable, consisting almost entirely of a reddish free stone of a soft texture, which soon moulders under pressure into dust or clay.

With regard to the form of these turnpike roads, they are from 30 to 40 feet wide, independent of the drains on each side. They are *metalled*, as it is called, with stones broken to a small size, in the middle, to a depth of 10 or 12 inches, gradually decreasing to 4 inches at the sides. The most advantageous form is evidently that degree of convexity which is just sufficient to allow the water to run fairly off; and this form is accordingly adopted here.

In former times, when heavy carriages were almost unknown, and when grain, and every other subject of commerce, was carried by back loads, little attention was paid to the direction of roads in this as well as in many other districts of Scotland; the nearest line was generally adopted, without much regard to the interference of hills and vallies. Though nature and common sense point out the southern verge of the Carse as the proper line of the road through Stirlingshire, from the Avon on the east to Buchlyvie on the west, yet little regard has been had to this direction, which would have afforded a nearly compleat level for about thirty four miles. Local interests, and particular-

X.

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Miles.

Bridge of Blane to the Strathblane road, not  
marked in the map

4

Total turnpike road in Stirlingshire,

116½

ly the accommodation of villages which occur in this line, have drawn the roads over many very inconvenient heights. A line of road, however, has been planned in this direction from Polmont to Stirling; a part of it has been formed, and a small part of it executed; a bridge, in the line of this road, has been thrown over the Carron, a little above Grangemouth, having a drawbridge of 80 feet wide over the middle arch, for the convenience of small craft passing up and down the river. This bridge has cost above L.4000. This road, so desirable for the accommodation of travellers and of heavy carriages, will, it is hoped, be soon carried on with increased funds and spirit.

An instance of the successful direction of a turnpike road, in a situation naturally the most unfavourable, occurs in that which has been carried over a branch of Lennox-hills, which separates the vale of Campsie from that of Fintry. The height of the mountain is about 800 feet. The ascent from Campsie by the old road was one foot in seven. It was called the *Craw* (or *Crow*) *road*, probably from the idea that it was accessible only to winged animals. By judicious direction and management, it is now easily passable to carriages of every kind: the ascent, even in the most precipitous parts above the village of Campsie, does not exceed one foot in twenty. By this road, and that which leads from Balfroun by Strathblane, (for which the public is indebted to Mr Speirs of Culcruch, and the late Mr Dunmore of Bandalloch,) a district of this county, formerly almost inaccessible, is now opened up to social intercourse, and to the extensive manufactures carried on, upon the banks of the Eudric.

## 2. Country Roads.

By these are understood the cross roads of the county on which no toll is paid, and which are made and repaired by statute labour alone, or by its conversion into money. These country roads, reckoning from Rowardennan on the west to the Avon on the east, and from the Kelvin on the south to the Forth on the north, may be estimated altogether at 117 miles. To these the whole statute labour of the county, or its conversion, is solely applied. Till the introduction of turnpike roads, (which is of recent date) no other provision existed in Scotland for making and repairing roads besides the statute of 1669, ch. 16. by which it is ordained, "That all tenants and cottars shall be called out on the highways, with all their carts, sledges, shovels, pitches, mattocks, &c. to work *six days* of the year, between bear seed time and harvest, for three years; and *four days*, ever afterwards." Heritors are by this act authorised to assess themselves to a certain extent, in proportion to their property, to be laid out in building and repairing bridges, &c.

The inconveniences arising from the requisition of the actual labour of the inhabitants of districts were early felt. On the one hand, it was felt as an intolerable grievance upon the tenants and their cottars to devote the required time to labour on the high roads, at a season of the year when so many other important operations

operations of agriculture urged ; and, on the other, it was observed, that the persons who were called out upon these occasions exerted neither skill or industry in performing the reluctant task. It is in the memory of the Reporter, when all the inhabitants of a parish in this district employed the whole of the allotted time in repairing a few yards only of the worst of the road, occupying the *lucid* intervals of suspended labour in drinking whisky, furnished by themselves, or by the accidental liberality of travellers.

In 1778, an act of Parliament was passed converting the statute labour in Stirlingshire at the rate of 18s. Sterling, for every L.100 Scots of valuation, and that of 2s. Sterling for every cottager and householder.

This act having expired in 1805, the gentlemen of the county drew up the heads of a bill, to be presented to the Legislature, by which it was proposed to raise the conversion money on every L.100 Scots to L.1. 10s.; and that all cottagers and householders, not receiving aid from the parochial poor's funds, should pay 3s.

When the depreciation of money, and the consequent advance of the price of labour are considered, it must be allowed, that the sum of 3s. is a far too moderate compensation for the labour of a man for six or even for four days in summer; and it will scarcely be credited that any opposition was given to so reasonable a proposition. Truth, however, compels the Reporter to state, that it was decidedly opposed by the Carron Company, who alleged, that the additional conversion money would bear hard upon their work people; they laid claim to a long list of exemptions, to  
which

which the country gentlemen declined to submit, and withdrew their bill, after it had been for some time before a committee of the House of Commons. The company having at length relaxed somewhat in their claims of exemption, a new bill has been lately passed fixing the conversion as above: The Carron Company have still some privileges, however, such as that of carrying on their carts five cwt. more than is permitted to others, without having wheels of a particular breadth.

### 3. *Farm Roads.*

The country roads in the carse are in general very indifferent, on account of the softness of the bottom, and the great scarcity and distance of materials for repairing them. In the neighbourhood of the Carron works, especially, the condition of the roads beggars all description. The materials employed to repair them are chiefly the *scoriae* or danders of the furnaces, which soon crumble into dust, under the numerous and heavy carriages which are every hour passing to and from this extensive establishment. It may be hoped that a proper sense of personal interest and convenience will lead the enlightened proprietors of these works to co-operate cordially with the gentlemen of the district in introducing good roads in this neighbourhood.

## SECT. II.—IRON RAILWAYS.

RAILWAYS, which have been introduced upon a large scale in the adjacent county of Clackmannan, are, from some unaccountable circumstance, scarcely known in Stirlingshire. Though it is certain that the Carron Company, by establishing railways throughout the vicinity of their important works, would make an immense saving; whilst they could, at the same time, construct them at a much cheaper rate than others, they have hitherto done nothing in this way. The only instances of railways that fell under the Reporter's notice in this county, are those leading from Lord Dundas's coal-works to the shipping place at Carron shore, of which mention has been made already\*, and another, extending about a mile, from the Banton coal-work, in the parish of Kilsyth, to the Great Canal. The declivity of this last is very great; but, a proper provision is made for retarding the motion in the descent. Six small waggons, containing altogether about four tons of coals, are connected with one another by chains; one horse draws the whole; and so nicely are the railway and the wheels adjusted to each other, that the same horse draws back the empty waggons without any difficulty. On the level railway on Lord Dundas's estate, one horse draws six tons; and it is presumed might draw two or three more.

Of

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\* P. 49: to which the reader is referred.

Of the great advantage of railways, and of dividing the load, by connecting several small waggons together, it seems to be unnecessary to speak here at great length. The subject is now pretty generally understood, and extensive lines of railway are proposed, and, it is hoped, will be executed in Scotland; no where could they be more easily or cheaply executed, and no where can they prove more beneficial than in the level carries of Stirlingshire, which abound so much in heavy articles of commerce, as well as in important and extensive manufactures.

A particular description of these railways belongs more properly to the report of the county of Clackmannan, where they were originally introduced, and where they are now carried to the greatest perfection. Suffice it to say, that they are formed by fixing down wooden sleepers of considerable breadth on the clay; a wooden rail of four inches square is then pinned down to the sleeper with oak pins; and over that, another rail, of the same dimensions, is pinned down in the same manner, care being taking that this last always crosses or overlaps the joints of the lower rail. On the top of this uppermost rail is fixed a bar of malleable iron, of  $1\frac{1}{2}$  inch in breadth, and about five eighths of an inch in thickness. To this rail, the wheels of the waggons which are used are carefully adjusted.



## SECT. III.—CANALS.

A SLIGHT attention to the circumstances of the isthmus of Scotland, formed by the near approach of the Firths of Forth and Clyde, and of which Stirlingshire forms so considerable a portion, must have suggested at an early period the possibility as well as the advantages of forming a junction between the Atlantic and the German Oceans. The idea of forming a canal to join the Forth and Clyde appears to have been entertained as far back as the reign of Charles II. But it was not till about forty years ago that any active steps were taken to carry it into execution.

That extensive tract of country which stretches westwards from Stirling to Gartmore, in the course of which, for twenty miles, the whole rise above the level of the sea does not exceed eighteen feet, seems to have originally suggested the line of a canal in that direction. From the neighbourhood of Buchlyvie, it was proposed to carry this canal through a valley of considerable elevation, by a farm called Bolatt, into Lochlomond, and to have the communication by the Clyde completed by rendering the river Leven navigable.

The Reporter recollects his having read, many years ago, a report of this line of canal by Messrs Goldborne and Watt, on which, however, he cannot now lay his hands. The levels were taken with all the accuracy

curacy that might be expected from gentlemen so eminent in science; and if a copy of the report can be obtained, a short account of that survey may form an acceptable article in the Appendix.

Mr Smeaton, too, under whose direction this great undertaking was at last commenced, surveyed this line; and he found the highest level at Bolatt to be 222 feet above that of the sea\*.

That line was accordingly abandoned, and the present line by Falkirk and Kilsyth, the highest level of which is only 141 feet, adopted. Still, however, it may be permitted to remark, that much advantage would arise to that whole district of country which stretches westward from Stirling to Gartmore and Buchlyvie, by carrying a canal of small dimensions as far as the level tract extends. It could be executed at a very inconsiderable expence; the ground, being either moss or clay, could be easily cut. Mr Smeaton, in his report of this line, remarks, "That two locks and "one dam would make an open navigation from Gartmore at all seasons of the year. One lock ought "to be placed opposite Craigforth-mill; and the lock "and dam at the ford of Frew. This, with a little "clearance of the shoal at Cardross, would make a "navigable passage over the same." By such a canal, it may be added, the coal and lime of the lower parts of the county could be carried to the highlands, where they

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\* See Mr Smeatons' Report in the Scots Magazine of 1767, p. 177.

The tonnage dues on the canal are twopence per ton for every mile. The revenue arising from this duty was annually encreasing from the first opening of the canal till 1792, when it amounted to £14,000. On account of the stagnation in trade in 1798, it fell somewhat below £12,000. Since that period, it has encreased rapidly. In 1810, the canal dues amounted to £40,000; but it is justly apprehended, that they will fall far short of that sum in 1811, from the general stagnation of trade, and from the present commercial embarrassments. The shares in the canal company stock sell from 25 to 30 per cent. above par.

With regard to the influence of the great canal on the agriculture of the district through which it passes, it must be evident that the facilities which it furnishes to the conveyance of every kind of manure must have a beneficial effect. The increase of commerce, too, must be taken into the account, for wherever commerce advances, agriculture will maintain a proportioned pace. The cheap and commodious conveyance, afforded to travellers by the track boats, is not unworthy of attention in this estimate.

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SECT. IV.—FAIRS.

THE central situation of Stirlingshire, with regard to the breeders of cattle in the northern and western counties on the one hand, and the buyers or dealers from

from the southern and eastern parts of the island, on the other, has, for a long period, rendered it the theatre of the principal fairs or cattle markets in Scotland. Of these, the Falkirk *trysts*\*, as they are called, are the most distinguished. These trysts were originally held upon a large common in the vicinity of Falkirk, which is, at present, in the course of being brought under cultivation; they are now held, on that account, upon a field in the parish of Larbert; but though the site be changed, the ancient name remains. They were formerly held upon a fixed day of certain months, but on account of the inconvenience which often arose from these days falling too early or too late in the week, they have been lately fixed to a certain Tuesday of those months.

1. The first Falkirk tryst is held upon the second Tuesday of August. There are generally exhibited there from 5 to 6,000 black cattle.

2. The second tryst is held upon the second Tuesday of September. There are generally exhibited about 15,000 black cattle, and 15,000 sheep.

3. The third tryst is held upon the second Tuesday of October, when there are generally exhibited from 25 to 30,000 black cattle, even 40,000 have been known to have been exhibited at this tryst; there are also, at an average, 25,000 sheep exposed to sale.

At the two last trysts, especially at that of October, a great number of horses are also exposed to sale.

Thus

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\* Tryst is a Scots term, signifying a preconcerted meeting, i. e. of the buyers and sellers of cattle.

Thus it appears that there are annually exhibited at these trysts above 50,000 black cattle, together with about 40,000 sheep. Taking the former at the moderate average value of L.8, and the latter at that of 16s. each, the value of the whole will amount to L.430,000. An intelligent friend, who lives near the spot, calculates that 50,000 black cattle are exposed to sale at the two last trysts alone; and he estimates, on good grounds, that the total value of the cattle bought and sold at these trysts must amount to half a million Sterling. All the black cattle brought to these markets are lean stock intended for wintering.

It is remarked that the number of cattle brought to these trysts is diminishing of late, from the circumstance that many dealers are now in the habit of driving their own cattle to England, instead of disposing of them at these fairs to English dealers, who are the principal purchasers.

Within these few years past, a fair has been established at Balgair near Fintry, which is fast rising into consequence. It is held annually on the Friday immediately preceding the 24th of July. There are, at an average, between 3 and 4,000 black cattle exhibited there. This fair has almost entirely supplanted a fair, formerly of some consideration, which was held about that period at Buchlyvie.

There are several other fairs for cattle held in this county, as at Denny, Balfron, Strathblane, Kippen, &c. The three former are held chiefly for the sale of milch cows. On the second Wednesday of November, and on two succeeding Wednesdays, a fair is held at  
Kippen

Kippen for the sale of fat cattle. About 120 cattle are sold at these fairs.

Of the inferior fairs of this county, and of the particular days and months on which they are held, it does not appear necessary to offer a particular enumeration; it may be obtained by consulting any Scots almanack. Almost every village has its annual or monthly fair; many of these are held for the purpose of selling grain and articles of accommodation for country families, who might find it difficult to procure them from the great towns; many of them are also held principally for the purpose of hiring farm servants.

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SECT. V.—MARKETS.

STIRLING is the county town and chief market place of the shire. It is a place of great antiquity. Commanding the principal pass to the north of Scotland, and being naturally a place of great strength, it was probably occupied by the Romans as a military station. Many remains of their operations may still be traced in the neighbourhood. It was erected into a royal borough by David I. about the year 1150. In point of antiquity it is considered as the fifth borough in Scotland.

The weekly market of Stirling is held on Friday. The revenue of the borough being ample, the magistrates have very laudably employed a part of it in erecting

ing commodious public buildings, and particularly in erecting excellent market places and granaries. The flesh market of Stirling, upon a Friday morning, exhibits a pleasing spectacle of the greatest abundance and variety of animal food, all of the best quality, and in the best condition, laid out on stalls in the cleanliest style, or hung up under sheds which effectually prevent any injury from the sun or rain. It is singular that on no other day of the week, not even on the morning of the next day, is one pound of meat to be seen in the market; the inhabitants of the town and neighbourhood, aware that they cannot procure a supply for their families till the next Friday, lay in their weekly stores; and as most of the butchers, who expose their meat to sale in this market, have their residence in the adjacent villages, they carry home with them in the evening what remains unsold, to be disposed of elsewhere. In summer, it would certainly be a more convenient arrangement to partition this market between two days of the week, at some distance from each other.

Falkirk is naturally the centre of trade to the richest and most populous part of the county of Stirling. It was formerly a borough of regality. It is now governed by a baron bailie appointed by William Forbes, Esq. the Lord of the manor.

The market day is Thursday. Great quantities of grain of every denomination are sold there. The butcher meat is also most abundant, and of the very best quality. But Falkirk exhibits the most striking contrast to Stirling, in its total want of accommodation for these important articles of agricultural commerce.

There

There are no public granaries to protect the grain from the weather, or to receive what remains unsold from week to week. There are no sheds to shelter the butcher meat; but the traveller is presented with the disgusting spectacle of the finest beef and mutton, pork, veal, and lamb, hung up or laid out on temporary stalls in the open street; and deprived in a short time of their inviting appearance and qualities by the dashing rains, or scorching sun. No where are proper market places more necessary than in this thriving village, surrounded as it is by so numerous a population.

Kilsyth is also a market town, but being situated halfway between Glasgow and Falkirk, and only 12 miles distant from either, its markets are not much frequented.

There are several large and populous villages in the county, as Balfron, Buchlyvie, New Burray, Kippen, Garganock, Bannockburn, St. Ninians, Bainsford, Lauriestown, &c. &c. from which the adjacent districts are supplied with the necessaries and conveniences of life.

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#### SECT. VII. WEIGHTS AND MEASURES.

THE great advantages which would accrue from the establishment of an uniformity in weights and measures

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were,



were, at an early period felt and acknowledged; and many attempts have been made by political economists, and even by the legislature itself, to carry this measure into effect. The bulk of the nation, however, unenlightened by science, and wedded to ancient practice, has persisted in adhering to local customs, and hitherto defeated every endeavour to attain this desirable end.

It would be highly improper upon this occasion to enter into a detail of the general system of weights and measures as it affects the empire at large. It seems only necessary to bring into view those regulations which are either peculiarly applicable to Stirlingshire, or which may appear to affect its practice in this respect.

In this view, it may suffice to remark that, when the commissioners appointed by the Scottish Parliament in 1617, to establish an uniformity of weights and measures through Scotland, committed the Scots ell, the standard of lineal measure, to the Magistrates of Edinburgh; the firloot, the standard of dry measure, to those of Linlithgow; and the standard stone to those of Lanark; they committed the jug or pint, the standard of liquid measure, to the Magistrates of Stirling.

This jug, or Scots pint, is accordingly still preserved by the borough, and contains, 103.404 cubic inches, or 3lbs. 7oz. Scots troy weight of clear river water, which are equal to 3lbs. 11oz. 13.44 drams avoirdupois; each cubic inch of this water weighs 253.18 English Troy grains.

The

The various articles of commerce, which are submitted to weight and measure, are regulated in Stirlingshire as follows, viz.

### 1. *Land.*

Land is universally measured in this county by the Scots acre, which is to the English acre nearly as 1 to 1.27, or, in other words, one Scots acre is a little more than one acre and one-fourth English.

The Scots ell is equal to  $37\frac{1}{2}$  English inches. The Scots mile of about 1973 yards is now in disuse; and the English mile of 1760 yards, universally adopted.

### 2. *Corn.*

The legal standards for all sorts of grain in this county were adjusted in the year 1754, by Dr Stewart, Professor of Natural Philosophy in the University of Edinburgh, and Mr James Gray. According to the standard established by them, wheat, rye, beans, pease, and white salt, are to be sold by the firlo, containing  $21\frac{1}{4}$  pints of clear river water, measured by the Stirling pint jug. Oats, barley, and malt, are to be measured by the firlo, containing 31 Scots pints, measured as above.

Cubic Inches.

Hence the above wheat measure will contain 2197.294.

That for oats and barley will contain 3205.524.

The Winchester bushel contains 2150.042.

Y 2

From

From this statement, it appears that the Linlithgow boll of wheat is somewhat more than four Winchester bushels; and the Linlithgow boll of oats almost equal to six Winchester bushels. The wheat firlof of Linlithgow appears to be about 2 per cent. larger than the Winchester bushel; and the Linlithgow firlof for oats nearly 50 per cent. larger.

Notwithstanding the above adjustment of the standards by those learned gentlemen, certain customary measures are still very generally in use, which are as follows, viz.

1. Wheat, beans, pease, and rye, are sold by the customary firlo, containing 2578.292 cubic inches, according to the following-table:

Standard Pints.

$1\frac{7}{8}$	=	Forpet.			
$5\frac{1}{4}$	=	4	=	Peck.	
23	=	16	=	4	= Firlo.
91	=	64	=	16	= 4 = Boll.

Hence it appears, that the above boll is 8.295 per cent. better than the Scots standard measure.

2. Oats, barley, and malt, are sold by the customary firloot, containing 3488.183 cubic inches, as by the following table :

Standard Pints.

$2\frac{1}{8}$	=	Forpet.			
$8\frac{1}{8}$	=	4	=	Peck.	
$33\frac{1}{8}$	=	16	=	4	= Firlet.
133	=	64	=	16	= 4 = Boll

Hence

Hence it appears, that the above boll is 7.258 per cent. better than the Scots standard measure.

### 3. *Liquids.*

The Stirling pint-jug, the standard measure of liquids, has been already described as containing 108.404 cubic inches. Half a Scots pint is a chopin; half a chopin is a mutchkin; a mutchkin contains four gills. The ale pint used in Stirlingshire contains about one sixteenth more than the standard measure.

### 4. *Wood.*

There is not much wood sold by measurement in this county. Oak coppice wood, including the large trees which have become timber, is sold in lots by public auction. Even full grown fir, and ash, and elm, are sold, for the most part, in the same way. The purchasers of these lots sometimes retail single trees by the usual mode of measurement; that is, by calculating the contents of the frustum of the cone formed by the tree.

### 5. *Wool.*

Wool is usually sold by the tron weight of 16 lbs. an additional pound is given to the stone in whole sale bargains.

SECTION VII.—PRICE OF PRODUCTS, COMPARED  
WITH EXPENCES.

Of the object of the Honourable Board, in the title of this Section, the Reporter professes himself unable to form a precise idea. If it is meant that an estimate should be given of the expences and profits of the various branches of agricultural industry, he must beg leave to recur to the apology already offered on this subject, in Chapter IV. Section VII. to which the reader is referred\*.

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SECTION VIII.—MANUFACTURES.

VARIOUS manufactures, of greater or less importance, are successfully carried on in Stirlingshire. Of these, however, it is not now proposed to enter into a detailed account; nor does their influence upon agriculture appear to be so direct as to require it.

1. *Weaving.*

Coarse woollens have been long manufactured in Stirling and in the adjacent villages. This neighbourhood

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\* See p. 104 and 105

hood was formerly famous for weaving *tartans*, the celebrated garb of the highlanders. In Stirling and in Bannockburn, the whole of the tartan employed in clothing the highland battalions in His Majesty's service was manufactured. The wool was procured chiefly from the counties of Peebles and Roxburgh, and spun and dyed here. A considerable change, however, having been made in the dress of the highland regiments, by laying aside the belted plaid, and by the introduction of pantaloons, this manufacture has dwindled away considerably. *Carpets* still form an important article of manufacture in Stirling; this carpeting is sold from 2s. to 4s. 6d. per yard. *Serge*, a coarse kind of woollen cloth, is manufactured every where about Stirling; it is sold from 1s. to 1s. 6d. per yard.

In all the considerable villages of this county, a number of looms are employed by the Glasgow manufacturers. In Kilsyth alone, there are between 4 and 500.

## 2. *Printfields.*

Of these there is a considerable number in Stirlingshire. The abundance of running water, with a sufficient fall, which is so frequently to be met with in this county, is highly favourable to such establishments. In the parish of Denny, there are two extensive printfields. There is a printfield on the estate of Mr Kincaid of Kincaid, in the parish of Campsie, in the buildings of which alone L.14,000 have been sunk.

### 3. *Cotton Mills.*

At Fintry, on the estate of Peter Speirs of Culcrnich, Esq. there is a cotton-work upon a very extensive scale, in which a great number of hands are employed. There is another large work of the same kind at Balfroun. Here 400 people are employed, drawing at an average L.150 a week. There is a small mill upon the Endrick, for the woollen branch, constructed nearly upon the same principles with the cotton ones.

It cannot be questioned that these establishments are of advantage to the agricultural interests of the districts in which they are set down. They afford a convenient asylum and the means of subsistence to the small occupants who had been ejected from their farms, to make way for tenants of proper skill and capital, who are now so generally introduced. They increase the consumption of the produce of the ground, and furnish a ready market for every article that is produced on the farm. The farmer, however, complains, that the wages of servants of both sexes are greatly advanced by the facility which these establishments afford of obtaining work at all times.

### 4. *Alum, Copperas, &c.*

In the immediate vicinity of Campsie, there are considerable chemical works carried on, where alum, copperas, soda, Prussian blue, &c. are manufactured on an extensive scale; and in which a very large capital appears to be embarked. The following account of  
of

of these works, liberally communicated to the Reporter by a gentleman who is concerned in them, must be interesting to the reader.

“The company produces the alum and copperas from a decomposed aluminous schistus found in a considerable quantity in the adjoining coal wastes. This schistus forms originally the covering or roof of the coal strata of the district, and is composed of silex, alumine, or clay, iron and sulphur; the two latter probably in a state of chemical union. Soon after the coal is wrought, this schistus, of various thickness, separates from a limestone stratum immediately above; thus falling down into the waste. In process of time, indeed, generally after the lapse of many years, owing to a constant circulation of air through these wastes, which, being level free, are always dry (an indispensable requisite to this operation of nature) the sulphur becomes oxygenated; and is converted into vitriolic or sulphuric acid; this, uniting with the iron, forms copperas, and with clay, sulphat of alumine, from which chrystallized alum is afterwards made.

“The decomposed schistus, as taken out of the wastes, is lixiviated, and the lixivia evaporated. Upon cooling, pure sulphat of iron, or copperas, separates. The mother waters are then boiled with a solution of sulphat of pot-ash, by which (the triple salt) chrystallized alum is formed; this separates in its turn by cooling, and is purified by subsequent chrystallizations.

“The making of Prussian blue, being a delicate and intricate process, although it is known that alum and copperas enter into its composition, the manipulation of this process is not divulged by the company; (the theory



theory is no secret.) Neither is that of the soda manufacture made public ; for which it is presumable that the company has local facilities ; amongst these, the abundance and moderate price of coal is no doubt to be reckoned."

### 5. *Iron.*

About 50 years ago, the most celebrated iron-work in Europe was established upon the banks of the Carron in this county, by Dr Roebuck, and Messrs Cadell and Garbet, who were joined in the undertaking by many gentlemen of great respectability. Perhaps there is no spot in Britain which affords greater facilities for such an establishment than that on which the Carron-works are erected. These works are supplied with iron ore from Cumberland and Lancashire. Iron stone abounds in the neighbourhood, as at Denny, Banton, Bonnyhill, &c. Limestone is carried by water from the Fife coast : and coal is found every where at no great distance\*. Excepting coal, all the other materials used in these works are conveyed by water carriage.

Some idea may be formed of the extent of these works, by stating, that they give employment to upwards of two thousand able bodied men ; and that the  
annual

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\* A large supply of coal is furnished from the Parkhall estate, where the first seam is 3 feet thick ; and the second from 4 to 6. There are upwards of 1000 acres of this estate which abound in iron stone.

annual expenditure in labour, is not less than from L.120,000 to L.130,000. Of the quantity of coal, iron stone, and limestone used, the Reporter cannot obtain information.

It is not proposed here to enter into a minute detail of the operations carried on at the Carron-works: Suffice it to say that there are five blast furnaces connected with these works, which are supplied with strong currents of air from iron cylinders, which are not only more durable than bellows, but produce a more powerful effect. These cylinders act as forcing pumps. There are also three cupolas, which receive a proper supply of air by means of pipes connected with the forcing cylinders. There are fifteen furnaces, which are kept in action by the external air, without the aid of an artificial blast.

At Carron, all kinds of cast iron goods are made of the most elegant forms, and of the most substantial kind. The vignette designs, on some of these articles, are models of good taste. Here was *invented* that kind of cannon which is now introduced into such general use on ship board, called, from the name of the place, *carronades*. It is a short gun which is moved in grooves, by which the friction is increased, and the recoil consequently diminished. The calibre of the cannons which are cast here, is bored out of the solid metal, which renders it more smooth and just in its direction, and hence less ready to burst in the time of action than when cast with a core. The operation of boring cannon affords an interesting spectacle. It is performed in the space of about 48 hours by machinery moved by water.

At

At these works, bar-iron is also made, according to the following process. The pig-iron is melted in a finery, and afterwards beaten out into plates about an inch thick. These plates are again broken into pieces, about two inches square, for the convenience of scouring them, &c. They are scoured in an iron cylinder connected with the water wheel; and when they are properly prepared by this operation, they are put into pots which are made of fire clay; and, in an air furnace, they are brought to a welding heat. In this state, they are brought under the hammer, and wrought into what are called *blooms*. The blooms are heated in a chafery, or hollow fire, and then drawn out into bars for various uses. In this condition, the iron is equal in goodness to that which is imported from Russia, under the name of *new sable iron*.

The machinery is moved by the water of the river Carron; and, as a provision against times of drought, there is a reservoir constructed in the neighbourhood which covers 30 acres of ground. But in very dry seasons, even this provision is not found sufficient. An engine has been contrived for throwing back the water which has been used, that it may be employed again. This engine raises about 4 tons of water at every stroke, and it makes about 7 strokes in a minute\*.

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\* For the above account of the Carron-works, the Reporter is principally indebted to the excellent Statistical Account of Falkirk, by Dr Wilson, Stat. Acct. Vol. XIX, p. 93.

By the charter of the Carron Company, they are authorised to employ a capital of L.150,000. This is divided into 600 shares, and ten shares are required to give a vote in the management.

That these extensive works, in which so many hands are employed, have some influence on the agriculture of this district, cannot be doubted. They increase the demand, and give an additional spring to industry. In this view, they have led to the general improvement of the country; but the Reporter feels himself bound to add, in the words of an intelligent friend well acquainted with that neighbourhood, "That they have contributed little to the improvement of the particular district in which they are situated." They consume, he remarks, "A great quantity of oats; but the oats of Hull or Aberdeen, being cheaper than those of Stirlingshire, they procure them from these places; so that the agriculture of these is more benefited by the Carron-works than that of Stirlingshire. If the barley of this county bears in general a better price, it arises from our vicinity to Glasgow, where pot barley is in great demand. I have no hesitation, therefore," he adds, "to say, that the Carron-works have only, in a very remote, and not in an immediate degree, affected the agriculture of this part of the county."

#### 6. *Distilleries.*

Many large establishments for the distillation of spiritous liquors are to be found in Stirlingshire. They  
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are of advantage to the agriculture of the district, by procuring a ready sale for barley ; and the culture of barley is undeniably an important article in the rotation of crops, as it is always accompanied by a rich addition of manure, and a succeeding rest under a crop of ameliorating grasses. At these distilleries, too, great numbers of cattle are fed and fattened for the butcher, which furnish a convenient supply of animal food, at all times, for the market. During the suppression of the distillation from grain, many of the distillers of this county used sugar ; but the spirit produced was esteemed harsh and unpalatable ; the beneficial rotation of crops, into which barley should always be introduced, suffered a derangement, and the supply of animal food was, in a certain degree, cut off. With the removal of the prohibition, the distillers of Stirlingshire have returned to the use of grain.

Besides the above, there are various other manufactures which are carried on to a considerable extent in this county.

There are many extensive tan-works, to which the abundance of oak bark, to be had in the vicinity, is favourable.

The numerous falls of the Carron, in the parish of Denny, have furnished favourable situations for mills of different kinds in that district. In the parish of Denny, there are nine mills for grinding grain ; there are two for spinning wool ; a mill for preparing dye stuffs ; and one for chipping wood. There are also three paper mills, where that manufacture is carried on to a considerable extent ; particularly that of coarse paper, which

which is furnished to Government for cartridges for the army.

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SECT. IX.—COMMERCE.

STIRLINGSHIRE, in former times, could scarcely be called a commercial county. A few vessels of small burthen come up, as some still do, as far as Stirling. Airth also enjoyed a considerable trade by sea. The sea port of Grangemouth, however, which is daily rising into increased consequence, and which actually occupies a distinguished rank amongst the trading towns of Scotland, claims our principal attention in this Report. The following account of the origin, and progress, and present state of the port and trade of Grangemouth, derived from the valuable communications of Alexander Laird, Esq. of that place, a gentleman intimately acquainted with the subject, will, it is hoped, be found interesting.

“The situation on which the town of Grangemouth stands was nothing but *sleech* and salt greens\*, previous  
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\* *Sleech*, or soft mud; with *greens*, or the marine vegetables, which naturally grow on it, are, as was noticed  
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to the opening of the Forth and Clyde navigation. About the year 1772, when the canal was opened as far west as Kirkintilloch, there was only a trifling coasting trade, with a few corn cargoes from the Baltic. After the commencement of the American war, about the years 1776 and 1777, a considerable foreign trade took place, particularly in the articles of timber from Memel; and of hemp, flax, iron, and deals from St Petersburg. It is from that period that Grangemouth may be considered as a sea port. At that time, it had no other name than *sea-lock*, which it retained till 1783, when Sir Thomas, now Lord Dundas, the proprietor, gave it the name which it now bears. The name is given from the circumstance, that the river Grange, or, as it is commonly called, the Grange-burn, runs from the south through the harbour, and is of such magnitude as to form part of the said harbour, above which it is navigable to vessels of 70 or 80 tons, as far as Grange; a barony belonging to Mr Home of Kaimes, about a mile south from Grangemouth.

Grangemouth is situated upon an angle formed by the junction of the river Carron with the Great Canal.

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in speaking of the *soils* of Stirlingshire, the character of the shallows on the Firth of Forth, which are left dry at ebb tide, and of which so many acres have been lately added to the Carse grounds of this county by embankments. This soft soil is of great depth. Mr Macnab of Grangemouth informed the Reporter, that the elegant houses which he has built there, and of which he is the proprietor, are founded, like the city of Venice, upon piles of wood.

The present site of the town is not of great extent, being only about half a mile from east to west, and about a quarter of a mile from north to south. There are several handsome streets already built, and the plan of several more is formed. The northern boundary being the river Carron, a street is proposed to be built parallel to it, to be called Carron street; the southern boundary being the canal, the bason and the harbour; there is already built South Bason Street; and parallel thereto, Grange Street has been laid out this season, (1811) and partly built. Across these, run South Charlotte and South Bridge streets, the south and east boundaries on this side being the river Grange. But if the proposed wet dock, to enter from Carron river at Holmerry, and to communicate with the present harbour, be carried into effect, it will be necessary to cut the river Grange to the southward thereof; in which case the site of the town may be carried south to any extent that may be required.

“To the westward of the south side of the town, is a large bason, which communicates with the canal opposite to Canal Street; it is formed for holding timber, and is capable of containing 300,000 feet in rafts. It generally remains in the bason until it is sold, or till there is occasion to send it up the canal, or in any other direction in the Firth.

“There are several very neat, and even elegant houses in Grangemouth; there is particularly in North Bason street a range of fine buildings on the same plan with those of Princes' street in Edinburgh, with a sunk area, and iron railing, and pavement in front. This street, when finished, will form a kind of half square.

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The custom-house, built by Lord Dundas, at the head of Harbour and North Charlotte streets, is a neat plain building. The foundation stone of the edifice, so necessary and so convenient to this thriving sea port, was laid on the 21st February 1810, and business commenced in it upon the 1st of December thereafter. The present population of Grangemouth is about 920, and is daily increasing.

“In speaking of the site of Grangemouth, it may be proper to observe, that the straightening of the river Carron from the mouth of the harbour to Holemerry, (where it was originally intended that the canal should terminate) has been attended with very great advantage; the distance is shortened by about a mile; the access to the harbour is made easy by cutting off a very intricate part of the navigation; and upwards of sixty acres of land have been gained within these two years, where was formerly the bed of the river. At Greenbrae, where ships of 300 to 500 tons burden were in use to discharge, because they drew too much water to get into the harbour, the ground is now under a crop of corn\*.

“The harbour of Grangemouth was formerly attached to the Custom-house of Borrowstounness, which is eight miles distant; and when the river Avon is not fordable, the journey is four miles longer by Linlithgow bridge. The trouble and expence daily incurred by this arrangement proved intolerable. Grangemouth is now rendered independent, by having obtained a custom-house for itself; an indulgence to which its importance unquestionably

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\* See pages 275 and 277.

questionably entitles it; and to which it is principally indebted to the exertions of the noble Lord Lieutenant of the county.

“The depth of water in the harbour of Grangemouth is generally in spring tides from 16 to 18 feet; and in neap-tides from 10 to 12 feet; but, in very high spring tides, there are frequently from 20 to 22 feet.

“The new dry dock, at the west end of the town, and entering from the river Carron, is expected to be finished this season; it is 190 feet in length by 34 feet in width. There will be  $13\frac{1}{2}$  feet water on the top of the blocks at spring tides, which will be sufficient to admit vessels of 500 tons burthen.

“The *proposed* wet dock, to enter from the river Carron at Holmerry, is meant to be 1500 feet in length by 300 feet in breadth, with 20 feet of water in the gates at spring tides; the gates to be 40 feet wide. This dock will contain 160 square rigged vessels with ease. This dock or bason is to communicate with the present harbour of Grangemouth, by a canal of 10 feet deep, 40 feet broad at bottom, and 60 feet at top. The whole expence of this undertaking was estimated several years ago at L.30,000; but, from the increased price of labour and of materials, it cannot now be finished for less than L.40,000.

“With regard to the commerce of Grangemouth, it may be observed, that it consists in an extensive coasting trade to and from London, and all the intermediate ports on the east and north coasts of England and Scotland; there is also a very extensive corn trade from Norfolk and the other corn counties of Britain, and occasionally to some of those places, particularly

in supplying them with Irish oats, of which large quantities, brought from the Clyde by the canal, were, in the end of the year 1809, sent to the London and Newcastle markets.

“ But the most important branch of the commerce of Grangemouth consists in its foreign trade. From Norway, are imported timber and deals : From Sweden, timber, deals, iron and tar : From Prussia, corn, timber, deals, &c. : From Russia, hemp, flax, iron, deals, linens, &c. Within these few years, timber has been imported in considerable quantities from the British colonies in America. The Carron Company conveys from this port the goods which are manufactured at their works, *by sea* to London, and the other cities and towns on the east coast of the island ; and *by the canal* to Glasgow, and consequently to the whole western hemisphere. The shipping of the Carron Company brings in return from England, grocery goods, dye stuffs, &c. for the supply of Glasgow, Paisley, Falkirk, Stirling, and many other inland towns and districts\*.

“ When trade was open to the Baltic, there was a very considerable export of colonial produce, and of British goods from Grangemouth, which may indeed be justly denominated the Port-Glasgow of the eastern coast. From its contiguity to the city of Glasgow, and

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\* The shipment of coals forms a considerable part of the trade of this port. Those of the Rumford coallery are sent both foreign and coastwise : From 50 to 100 tons per day can be sent down and shipped. Large quantities of the Banton coal for smithies are shipped for Norway and the Baltic.

and the other ports on the Clyde, and especially by the facilities afforded to commercial communication by the great canal, Grangemouth is evidently the most convenient station for an extensive commerce on the eastern coast of Scotland.

“ This, however, is to be said only of times of peace with the northern powers. In 1805, when our trade was open with these powers, the commerce of Grangemouth may be estimated in some measure, by stating that the revenue paid by it, at the Custom-house of Borrowstounness, (to which this port was, as has been said, then attached,) was about L.44,000 Sterling. The tonnage of shipping, foreign and coast ways, was then 45,000 tons. In 1810, from the circumstance that the principal imports consisted of coarse articles from Norway and Sweden (a few cargoes from Russia and Prussia excepted) although the shipping was upwards of 60,000 tons, the duties did not exceed L.30,000. A custom-house being now obtained, and the bonding system being expected to be extended to this port, there is no doubt that the trade will increase as soon as the communication between this country and the northern powers, so mutually advantageous to both, is re-established.

“ The charges on shipping and goods at Grangemouth are very low in comparison with most of other ports in the kingdom. The harbour dues for British ships are only one penny halfpenny per ton register; on foreign ships, three pence per ton: Pilotage from the harbour to the roads, that is, from the mouth of the river Carron nearly to Culross, a distance of 3 to 4 miles, is generally from five to ten shillings for small  
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vessels; and from that sum to two guineas, for larger vessels. The shore dues on all goods landed and shipped are one penny per ton; and the basonage on timber is two pence per ton per month."

To complete the history of the trade of Grangemouth, it may be proper to add to Mr Laird's account, the statement given about twelve years ago by Dr Wilson, the intelligent minister of Falkirk.

"The tonnage at this port is at a medium as follows: Vessels from England, which bring cargoes from foreign places, about 5,000 tons annually; coasting vessels from England about 4,000 tons; vessels belonging to Scotland, employed in foreign trade, 10,000; Scotch vessels employed in the coasting trade, 9,000 tons; vessels employed by the Carron Company, at least 9,000 tons; and foreign vessels, about 2,000 tons."

From these accounts, some estimate may be formed of the progress of commerce at this port: It appears that the shipping of Grangemouth amounted,

In 1799,	-	-	To about 39,000 tons.
In 1805,	-	-	To 45,000 tons.
In 1810,	-	-	To upwards of 60,000 tons.

It may be questioned whether this be the proper place for noticing, that in winter 1796—7, more than 500 vessels, from 20 to 80 tons burthen, were employed in the herring fishery on the coast adjacent to Grangemouth. They belonged to different parts of England and Scotland. Besides great quantities of herrings disposed of in that populous neighbourhood, in a fresh state, it was computed that above 300,000 barrels

rels were cured, as no less than 600,000 bushels of salt were used on the occasion.

*Influence of Commerce on Agriculture.*

On this subject a few words will suffice. It cannot be questioned that a commercial town contributes to the amelioration of the adjacent district of country; it increases the population, and consequently affords a consumption for the produce of the soil. Perhaps the most beneficial effect of commerce upon the agriculture of the neighbouring country, is the stimulus which is given by the example of industry, of attention to business, and of increasing opulence, to the exertions of an order of persons who, without this spur to exertion, would have been contented to live, as their fathers had done, in sordid inactivity and want. The influence of the trade of Grangemouth is evident in the adjacent territory.

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SECT. X.—THE POOR.

THE maintenance of the poor, and of those who by disease or accident have been rendered unable to provide for themselves, forms an important object in the political economy of every civilized country. It is not intended in this place to enter into an examination of the various schemes which have been suggested or adopted for this purpose, but only to advert to the mode of providing for the poor which is most generally prevalent in Stirlingshire.

Though there is an act of Privy Council still in force\*, by which the heritors and kirk-session are appointed to impose a parochial assessment for the support of the poor, the one half upon the heritors according to their valuation, and the other upon the tenants and householders according to their ability, only a few of the more opulent and populous parishes have had recourse to an assessment. These parishes, with their respective assessments, are, as far as the Reporter can learn, as follows :

Airth, a small assessment.

Falkirk, L.1 Sterling on every L.100 Scots of valued rent.

Larbert and Dunipace, about one penny on the pound Sterling.

Logie, 8s. 4d. on the L.100 Scots of valuation.

St. Ninians, from 12s. to 18s. on the L.100 Scots of valuation.

To our southern neighbours, on whom the oppression of poors rates weighs so vexatiously, it must appear truly wonderful that, in so extensive a county, a proportion so very small of the maintenance of its poor should be raised by an immediate tax on property. The poor of Stirlingshire, as is the general case over Scotland, are supported, as has been formerly observed†, by the weekly collections at the churches, with other incidental funds raised under the direction of the kirk-session.

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\* See p. 100.

† Ib. id.

session. Almost every parish in the county has, besides a sum of mortified money, the donation of charitable persons, and the interest of which is added to the distributions. An account of the income of the poor of the several parishes, from whatever source arising, will be given, as far as it has been ascertained, in the annexed Tables.

The whole of these funds are administered almost exclusively by the minister and elders of the parish, who are necessarily the best acquainted with the circumstances of the poor; and it is certain that never were funds of such an extent administered more faithfully or more gratuitously. Though the heritors are entitled to assume their share in the management, they seldom interfere, probably from a well founded conviction of the integrity and attention with which the kirk-session discharges this important duty.

It is necessary in this place to observe, that there is reason to apprehend, that the mode of providing for the poor by *assessment* will, in process of time, be more generally resorted to. When trade and manufactures are advancing so rapidly, the poor must become more numerous, as well as more clamorous. But it may be permitted to say, that the longer the heritors and kirk-session can ward off the measure of *assessments*, the better it will be for the country, and even for the poor themselves. Wherever ample funds for charity are held out, the industry of the poor will flag; and the demands upon the fund will proportionably increase.

At present, there exists very generally amongst the labouring and lower orders, an honest pride of independence, which prompts them to continue the exer-

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tion of personal industry as long as they are able to earn any thing for themselves. They are averse to any application for parochial aid till the utmost necessity compels them.

This spirit prevails chiefly among the lower orders in the country parishes. It ought to be carefully cherished ; whilst it is maintained amongst us, it will constitute a valuable addition to our national industry ; and the poor man, whilst he feels it, will be a better man, and have more true enjoyment in the scanty meal which he has earned by his own exertions, than in the insipid provision which is made for him in a parish asylum, or by a parish assessment.

Mendicity is, at the same time, too frequent amongst us. In our towns and villages, beggars infest us in every corner and alley ; and from these towns and villages, they sally forth and overrun the country parishes. Indeed, almost all our beggars are the refuse of towns and manufacturing districts ; by their idleness, profusion, and dissipation, they have reduced themselves to want, and, in the infamy of their morals, they have lost the sense of shame.

An intelligent gentleman of this county, himself the proprietor of a flourishing manufactory on his own estate, pointed out to the Reporter the pernicious effect of manufacturing villages on the morals of the people. "The working people at these manufactories," he observed, "are generally persons of dissipated habits. "When trade is brisk, they sometimes earn 20s. a week or more ; with the inconsideration of depraved minds, they spend all as soon as it is earned ; when work fails, they have no resource for themselves  
" and

“and for their families, but begging; and to beg, *they* are not ashamed.”

This is unquestionably a great political evil; and in a manufacturing state like this, it becomes an important question where the remedy is to be found. Would it not be a proper measure, that the proprietors and managers of these manufactories should admit none into their works without binding them down, under pain of forfeiting a certain portion of their wages, to lay aside, in a well secured fund, a weekly sum out of their earnings, as a resource for themselves and their families in the day of calamity.

Friendly societies of this kind, or box clubs, as they are called, are common in this county, as well as through the rest of Scotland. There are two of these in the town of Stirling. They are common in every district. When persons, who had contributed for a certain time to the common fund, become disabled for work, or when they die, leaving a widow or children, a certain weekly sum is given from the fund, proportioned to the rate which had been contributed. This beneficent scheme has lately received the sanction of the legislature. The only addition that seems to be required, is to *oblige* every person, in the labouring and manufacturing line, to become a member of one of these societies; and this can be done only by the influence of masters and proprietors of great establishments.

In every populous district, there should be houses of industry as well as houses of discipline. In the former, the well disposed poor might find useful employment;

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in the latter, the profligate might be restrained, and in some measure reclaimed.

In both these respects, Stirlingshire is miserably deficient. Houses of correction, in the several districts of the county, are particularly required. How many petty crimes and misdemeanours which harass the public, and occasion serious evils to individuals, are allowed to pass unpunished, because they are not of such magnitude as to call the attention of the public prosecutor ; whilst the private sufferer is disposed to submit to the injury, rather than incur the trouble and expence of sending the offender to the county jail, and bringing him to condign punishment ? Were there houses of discipline erected in proper situations, under proper regulations, and under the direction of the Justices of the Peace, those petty crimes would soon cease to be heard of.

If Stirlingshire, however, be deficient in houses of industry and correction, it possesses abundance of richly endowed hospitals. These charitable establishments have evidently had their origin in the same principle, which led, at a still more remote period, to the endowment of monasteries, and the liberal donations of land and money, which were made to particular churches, *pro salute animæ* ; and it may be questioned, whether the utility of these endowments is not, in both these cases, nearly equal. A very amusing account of the hospitals of Stirling is given by the Rev. Dr Somerville\*, of which a short notice will suffice : The *present* revenue

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\* Stat. Account, vol. xviii. p. 285.

revenue of these hospitals is given on the unquestionable authority of Mr William Mackinlay writer there.

1. Robert Spittal tailor to King James V. of chivalrous memory, founded an hospital in Stirling, about 1530, for the support and relief of poor tradesmen; the funds arise from the rent of lands,

2. James Cowan merchant in Stirling, in 1639, founded an hospital for the support of 12 decayed guild brethren. An elegant house, which still remains, was built for their reception; but the objects of this charity persisted in refusing to leave their own homes, and to occupy it. The funds accumulated; lands were purchased with them; not only decayed guild brethren, but their widows and daughters are admitted to a share in these funds, which, as it appears, are still accumulating.

3. John Allan writer in Stirling, about the year 1725, mortified the sum of 30,000 merks Scots, for the maintenance and education of the children of decayed tradesmen, a charity of all others the most judicious and the most useful; the fund consists of the rent of lands in which the money was invested.

4. Besides these charitable foundations, the funds of the guildry, or merchant company, defray the expence of educating the poor guild brethrens children, and assist them in purchasing clothes, and in paying their apprentice fees.

In order to enable the reader to form an adequate idea of the progress and state of the funds of these hospitals, and of the number of persons to whom their benefits extend, the account given by Dr Somerville  
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in 1793, and that given by Mr Mackinlay in 1810, are subjoined.

In 1793, the state was as follows :

	Income.	No. of Paupers.	Receive per week.
			s. d. s. d.
Spittal's,	L. 221	44	From 1 1 to 2 4
Cowan's,	L. 1158	about 100	From 1 6 to 2 6
Allan's,	L. 298	14 boys maintained, clothed, and educated, from the age of 7 to that of 14 years; and on leaving the hospital, 100 marks to put them to a trade.	

Mr Allan besides, by a clause in his will, ordered supply from these funds to be given to any of his poor relations who might be in indigent circumstances.

Mr Mackinlay's account of these hospitals in 1810.

	Income.	Paupers.	Average allowance per week.
Cowan's,	L. 3000	118	5s. 8d. to 2s.
Spittal's,	L. 561. 4s. 10d	104	1s. 8d. to 2s.
Allan's,	L. 568. 16s. 9d.	43, 36 of whom are boys, who are educated and clothed there.	

Though the account of the ordinary poor's funds of the parish of Stirling must appear in its proper place in the statistical table, it may be proper, in connexion with the above statement of the hospital funds, to add that of the other charitable funds of that town as they stood in 1810.

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From ordinary collections, and interest of money	-	-	208 14 6
From voluntary contributions for poor householders	-	-	230 0 0
From these funds, 110 paupers receive from 6d. to 1s. 8d.			

8d. weekly. Thus it appears, that the annual income of the charitable establishments in the parish of Stirling, amounts to L.4468. 15s. 1d. and that the number of persons who receive charity from these funds is 370. Taking the population of the parish as it was stated in 1802, at 5256, it follows, that every 14th person nearly receives public charity; and perhaps, if the population of the country part of the parish (to which the hospital charities do not extend) be deducted, it may be reckoned, that nearly every 12th inhabitant of the town receives charity.

The managers of Cowan's hospital are the Town Council, together with the first minister of Stirling. The managers of Allan's hospital are the Town Council, and the second minister.

The Reporter has discovered one other institution of this kind in the county. There is in the town of Falkirk an hospital for the support of four aged and infirm persons. It was founded and endowed by Lord Livingstone of Almond and Callander, in 1640. Certain parts of the estate of Callander are burthened with this endowment; the proprietor of the estate of Callander presents to it; but if he refuses or neglects to do so, the minister of Falkirk is authorised to fill up the vacancy.

## SECTION XI.—POPULATION.

INSTEAD of giving the statistical table of the county of Stirling in one view, as is done in the Report of the county of Bamff, which was transmitted as a model in this respect, it is presumed that it will contribute to perspicuity to give the tables of population separately in this Section; and to give the tables of rent, minister's stipends, schoolmaster's emoluments, income of the poor, &c. in an Appendix.

In the following table, the population is given by parishes, with references to the volume and page of the Statistical Account of Scotland; a work which cannot be too highly estimated. It is given at three different periods, viz. the year 1755, from Dr Webster; the years 1790-1798, from the Statistical Account; and the year 1801, from the enumeration made under Mr Abbot's bill. The number of *inhabited* houses in the county is added from this last source. The increase and decrease, from 1755 to 1801, is given in separate columns. The Reporter having obtained still more recent information concerning the population of *ten* parishes of the county, chiefly from the ministers of these parishes, this is joined in a separate column. With regard to the *four* parishes that are situated partly in Stirlingshire, and partly in other counties, the population of that part only which lies in Stirlingshire is given. The Reporter has some expectation of obtaining the lists of population taken up this year (1811) under the late act; if he is fortunate enough to procure these, they will be given in the Appendix.

Table

TABLE OF THE POPULATION OF STIRLINGSHIRE.

I. Statistical Account.			II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.
Parish.	Vol.	Page.	Population in 1755.	Population 1790, 1798	Population 1801.	Population 1806, 1811.	Increase from 1755. to 1801.	Decrease.	Inhabited Houses.		
1 Airth - - -	III.	186	2316	2350	1855	2000	—	495	323		
2 Ayr - - -	NVIII.	125	436	612	787	800	351	—	153		
3 Baldernock - -	XV.	271	611	620	796	—	185	—	159		
4 Balfon - - -	NVII.	530	755	1381	1634	1800	879	—	206		
5 Bolkennar - -	NVII.	295	529	600	575	—	46	—	125		
6 Buchanan - - -	IX.	12	1699	1111	748	—	—	951	121		
7 Campsie - - -	XV.	314	1399	2517	2906	—	1507	—	599		
8 Denny - - -	II.	420	1392	1400	2033	—	641	—	247		
9 Drymen - - -	VIII.	540	2789	1607	1608	1500	—	1181	324		
10 Falkirk - - -	XIX.	71	3932	8020	8838	10,395	4906	—	107		
11 Finny - - -	XI.	371	891	543	958	910	67	—	176		
12 Gargunnoch - -	XVIII.	96	956	830	954	—	80	2	173		
13 Killeath - - -	XVI.	100	959	973	1039	2800	367	—	545		
14 Kilsyth - - -	XVIII.	214	1395	2450	1762	1381	—	—	238		
15 Kippin - - -	XVIII.	317	—	—	1248	5000	2353	—	653		
16 Larbert & Dunipace.	III.	333	1864	4000	4217	—	—	—	241		
17 Muiravonside - -	I.	206	1539	1065	1070	—	—	469	430		
18 Polmont - - -	III.	344	1094	1400	2194	—	1100	—	1324		
19 St. Ninians - -	XVIII.	385	6491	7079	6849	—	358	—	183		
20 Slamanah - - -	XIV.	78	1209	1010	923	—	1505	286	614		
21 Stirling - - -	VIII.	271	3951	4698	5256	—	—	63	112		
22 Strathblane - -	XVIII.	563	797	620	734	821	—	—	77		
23 Part of N. Kippatrick.	—	—	—	—	908	965	—	—	37		
24 Part of Lacropt -	—	—	—	—	248	—	—	—	141		
25 Part of Logie - -	—	—	—	—	671	—	—	—	—		
Total - - -	—	—	37,004	44,886	50,811	—	14,145	3417	7308		

Observations



*Observations on the Population Table of Stirlingshire.*

1st, In the population lists of the parish of Kippen, New Kilpatrick, Lecropt, and Logie, (which are partly situated in other counties,) the number of inhabitants belonging to Stirlingshire was never particularly stated, until the enumeration was made under the act in 1801. The population of these parishes, therefore, is omitted in columns 4 and 5: But there is good reason to conclude, that it has increased considerably since the year 1755, and even since the years 1790—1798, (or, as it may be taken at a medium, the year 1794.)

The parishes of Kippen and New Kilpatrick are known, (as will be afterwards stated,) to have increased, the former by 132 souls, from the year 1801 to 1808; and the latter by 57, from 1801 to 1811. If the same proportion be assumed with regard to Lecropt and Logie, the increase of the former will be about 15 souls; and that of the latter about 42; making in all an addition of 246 souls since the year 1801.

To complete the above two columns of the table, therefore, it will be necessary to add to them the population of 1801 nearly. Taking it, however, without any deduction, the population of the Stirlingshire district of these four parishes amounts to 3075. This added to column 4, gives the total population of Stirlingshire in 1755 at 40,079; and, added to column 5, it gives the population of 1794 at 47,961: The population of 1801 is 50,811.

2d, The total increase of the population of the county from 1755 to 1801, appears to be 14,145; from which, if the total decrease, being 3447, be deducted, there will remain 10,698 of absolute increase, independent of that which has taken place in the four parishes which have been mentioned, and which has been calculated at 246 souls; this makes in all an absolute increase of 10,944.

3d, From column 7 of the table, in which the Reporter gives the population of *eleven* parishes of the county, from information recently obtained from sources apparently most authentic, it appears that in 9 of these parishes, there has been an additional increase since the year 1801 of no less than 3879 souls; whilst in the other 2 parishes, there has been a decrease of only 156; thus leaving an absolute increase from the above period of 3723 \*.

4th, If it be admitted (as it would seem it ought to be) that the population of these *eleven* parishes has increased since 1801 by 3879, whilst it has decreased by only 156, leaving a general increase of 3723, it will

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follow

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\* The Reporter acknowledges that, in the part of the table that relates to Kilsyth parish, there is something which he cannot satisfactorily explain. In 1790—1798, the population is stated at 2450. In the government census, 1801, it dwindles down to 1762, leaving a decrease of 688. Dr Rennie, again, writes in 1808, "That in a survey made in 1800, the population was 2800; that it was rapidly increasing during the last eight years, and might then be taken at not less than 3,000 souls." There seems evidently to be some error in the estimate made under the act in 1801.

follow that, taking the number of parishes as in the table at twenty-five, the increase on the whole since 1801 should be 5665, whilst the decrease should be only 380; thus leaving a general increase during that period of 5,285 souls. The whole population of the county of Stirling will then amount to about 56,000.

5th, It appears that the increased population has taken place in those parishes in which manufacturing establishments have been introduced or extended, as in Balfron, Campsie, Denny, Falkirk, Larbert, Polmont, &c. The decrease has taken place in parishes where agriculture, and particularly grazing, are exercised, as in Airth, Buchanan, Drymen, Muiravonside, Slamannan, and Strathblane. But it must be observed, that the depopulation which has taken place in these districts is not to be regarded as the mark of a deteriorated, but, on the contrary, of an improved system of agriculture. In former times, when the price of labour was low, and manufactures unknown, every occupant of land retained upon his farm and in his house a great number of starving cottars, and of idle and unskilful servants. Every farm was a petty village, the farms themselves were small, and the tenants were numerous and poor. This slovenly system is now happily done away. In the agricultural districts, the farms are enlarged; and from the superior skill of servants, and the improvements introduced in the implements and machinery that are employed, fewer hands are necessary. In the grazing districts especially, the farms are extensive, and very few servants are sufficient to tend the cattle. In Fintry for example, though a large cotton-work and a very considerable village have been lately

lately erected, it will be seen, by column 7 of the table, that the population has decreased since 1801, by 48 souls; that of Buchanan has decreased since 1755, by 951; and Drymen, by no less a number than 1181. But let it suffice, in answer to the croakers against the enlargement of farms, and the exchanging of men for sheep, that the general population of Stirlingshire has undeniably increased within these few years, by at least 12,000, or more probably by 16,000 souls.

With regard to the question, whether the county be *over* or *under* peopled, it may be sufficient to observe, that if by being *under peopled* is meant, that the number of the inhabitants is insufficient to consume the produce of the soil, whether in grain or in animal food, it must unquestionably be considered as *under peopled*. Stirlingshire certainly produces more wheat, barley, oats, &c. as well as more beef, mutton, and other kinds of animal food, than what is sufficient for its own consumption, and consequently sends large supplies of these to other parts of the country.

But there is another point of view in which it may be styled merely a *well-peopled* county. It abounds in villages, many of which are populous, and yearly increasing. There is a sufficient number of hands to carry on the operations of agricultural and manufacturing enterprise; and as all the districts of the kingdom are not equally productive of food for man, it seems necessary and proper, that the richer districts (of which number this certainly is to be reckoned,) should not consume all their produce within themselves, but that they should contribute from their superabundance to the subsistence of the poorer.

With regard to the number of persons inhabiting towns and villages, no very certain estimate can be given. After premising that most of these towns and villages are daily increasing in population and size, the following enumeration is offered.

*Towns and Villages in Stirlingshire.*

	Population.
Airth	900
Balfron	1,400
Bainsford	800
Buchlyvie	410
Camelon	568
Falkirk	4,196
Gargunnock	400
Grangemouth	920
Killearn	230
Kilsyth, Old and New Towns	1,200
Kippen	380
Lauristown	400*
Stirling	5,900
St. Ninians	}
Bannockburn	
Earbert	
Denny	
Polmont	
New Finty	5,000*

Total population of towns and villages  
in Stirlingshire. 22,804

With regard to the *healthiness of the district*, some data have been already furnished in treating of the climate

climate and soil of the county. It is liable to no peculiar distempers. Some account has been given of the disappearance of intermittent fevers, in consequence of draining and deep ploughing in the Carse\*. In this moist and weeping climate, working people, who have much occasion to be exposed to the weather, are frequently afflicted, especially in advanced life, with rheumatic complaints. A careful attention to putting on dry clothes, immediately after leaving off work and coming home, cannot be too earnestly recommended to persons in such circumstances.

With regard to *the food and mode of living*, it does not seem necessary to add any thing to what has been suggested under the articles of the *preparation* of the different kinds of grain, and particularly that of the *price of provisions*, Chap. XV. Sect. ii. It may be observed, upon the whole, that the peasantry of Stirlingshire, especially those who farm upon a large scale, either in the grazing or agricultural line, enjoy the comforts and conveniences of life in as great abundance as persons of the same order do in any county of Scotland.

## CHAPTER XVII.

## OBSTACLES TO IMPROVEMENT.

ON this part of the subject it will be unnecessary to enlarge. Some of the obstacles to the improvement of this county have been already alluded to ; and many of those which are suggested in the plan of the Board of Agriculture have no existence in it. No instance, for example, occurs to the Reporter of the want of *power* to improve by *inclosing* ; unless by the want of *power* be meant the want of *means*, which is a not unfrequent occurrence. *Tithes* are unknown in Stirlingshire. The *poor*, as has been stated, are supported principally by voluntary contributions ; and in the few instances in which assessments have been resorted to, they are so trifling as to be scarcely felt.

With regard to the obstacles to improvement from *enemies*, they are, no doubt, common to Stirlingshire with other counties of Scotland. The red or wire worm, and slug, do not appear to be particularly destructive in this district. A singular phenomenon that occurred in this, and the adjacent counties in 1808, of the devastation so widely threatened by the slug, has been  
already,

already, perhaps by an improper anticipation, described\*.

Rats and mice abound here as elsewhere. Their depredations in the farm yard may be prevented effectually, by placing the stack, as is here frequently done, up on a frame of wood, supported by small pillars of stone, with a coping which projects so that no vermin can ascend. The Reporter has some where seen it asserted, that vermin may be expelled by strewing about the leaves and stem of the *cynoglossum officinale* bruised, when full of sap†. Such an easy process deserves a trial. Rats are too cunning to devour arsenic as it is to be had from the shops; its grittiness, in that state, offends and alarms them. A gentleman of this county purchased the secret of the preparation from a rat-catcher for a guinea; and it consists only in triturating it in a mortar till it has become an impalpable powder, and, when mixed with meal, rats will devour it freely.

Sparrows and other small birds are accounted enemies, and they no doubt do much mischief; but it may be justly questioned whether they do not effect a greater good, by destroying the eggs and larvae of insects, which, were they permitted to multiply without such a check, would over-run and lay waste the vegetable kingdom.

#### Moles

The *cynoglossum officinale* grows, though sparingly, on a bank ½ mile to the north of the church of Dalfron. It may probably be found in many other parts of the county.



Moles are by some accounted enemies, but the prejudice is founded in ignorance; they furnish always a certain indication of a well conditioned soil. Moles feed on worms; and worms serve many important purposes in the economy of nature; without them, the superficial stratum of the earth would either be locked up in an impervious paste, or drowned in a miry swamp. Worms, and the moles which feed upon them, by perforating the soil in a thousand directions, keep the vegetable mould open; they furnish innumerable natural drains that lead off, by the declivities, the water which would otherwise accumulate under the surface; and they thus preserve the soil in a state admirably fitted for the expansion of the roots of plants. Mole-hills are indeed a nuisance in grass lands, but they can be easily spread and made to serve as a topdressing.

Pernicious insects may be destroyed by the application of quick-lime, of alkaline and neutral salts, of sea salt, and of soot.

From the great and increasing extent of the woods and plantations of this county, foxes, martins, polecats, and wild cats are frequent, and commit many depredations on the flocks and poultry. On the Duke of Montrose's estate, a fox-hunter, furnished with a proper pack of hounds, is regularly employed and paid by the grazing tenants according to the extent of their possessions.

The want of shelter from planting (though there are many extensive plantations in this country,) is, in many instances, to be accounted an obstacle to improvements in a district like this, which forms the narrowest part of Scotland, and is exposed, during so long a proportion

tion of the year, to the south-western blast. This part of the subject, however, has been already exhausted in speaking of the *form of plantations* \*. Great exertions are now making in various parts of the county to remedy this evil; and it may be hoped that, by the judicious application of shelter, its blackest soils will in process of time be rendered fertile.

The disadvantages arising from the small size of farms, an evil, too, prevalent in some parts of this county, where a better system might have been expected, have been noticed already in Chap. IV. Sect. i.

But the great and leading obstacle to improvement in this, as well as in many other counties, is the want of *disseminated knowledge on subjects connected with agriculture*. Agriculture is a science, to the right understanding of which many subsidiary branches of knowledge are indispensably requisite.

An agriculturist should be so far acquainted with the principles of mechanics, as to be able to judge of, and direct, as well as occasionally to improve, and even to invent, the most useful instruments used in rural economy.

He should know the principles of botany, at least so far as to be able to distinguish the families and species of the native vegetables of his own country; nor will it be sufficient to know them by their trivial English names; these are frequently too vague to furnish a precise distinction; they must be known by the accurate characters of the Linnaean nomenclature.

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\* P. 226.—See also p. 121, Note.

But the most important branch of subsidiary knowledge which claims the attention of the agriculturist is chemistry, so far as it relates to the process of vegetation, and the use and application of manures. Without this knowledge, he is exposed to the risk of making many useless and expensive experiments, and of wasting much precious time, as well as materials.

The Reporter acknowledges that, in suggesting some views which had occurred to him on the two last of these subjects, it has been his object to excite a taste in agriculturists for sciences so intimately connected with their profession : he is no adept in either of them ; he professes to be only a humble amateur.

Till a taste for such studies becomes more prevalent, especially in agriculturists possessed of a suitable capital to enable them to engage in improvements upon an enlarged scale, no very considerable advances can be looked for in this department. It is with men of science and of comparative opulence that all the late spirited improvements have had their rise. Such only can encounter the expence and the casual losses which attend new experiments ; and it is in such only, that we can expect that spirit of enlightened investigation which leads to important discoveries, or which can apply these to their proper use. Never can such discoveries, or the application of them, be expected from the gropings of ignorance, or from the grovellingings of poverty.

This disseminated knowledge must begin with the landed proprietors, who, though many of them hold a portion of their lands in their own possession, are very generally strangers to the philosophy of agriculture. They do not know how much they abridge their own  
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enjoyments, as well as their profits, by neglecting such amusing and important studies; the general science which country gentlemen almost always possess would render the acquisition of the scientific principles of agriculture both easy and agreeable. A professorship of agriculture being now established in the university of our metropolis, and held by a gentleman so eminently qualified for the office, every landed proprietor who sends his son to be educated there, should consider it, at least, as necessary for him to study agriculture and the subsidiary sciences, as to study Greek or Logic.

The example, and even a portion of the knowledge of the landed gentlemen, will soon descend, and diffuse themselves amongst their tenants; and at length knowledge and practice will combine in carrying agriculture to all the perfection which the soil and climate admit.

CHAP.

## MISCELLANEOUS ARTICLES

## SECT. 1.—AGRICULTURAL SOCIETIES.

The exertions of the Kilsyth association, and of the Gargunnoch club, in promoting the former of these purposes, as well as the premiums given to the successful candidates, have been detailed in a former Section, when speaking of live stock\*.

**“ This**

"This club was instituted in 1795, by the late General Fletcher Campbell of Salton and Boquhan, with the concurrence of several of the most respectable gentlemen in the neighbourhood.

Its principal object is to promote improvements in agriculture, by the united endeavours of the proprietors of land, the clergy and the farmers, and also of the merchants and artificers. The institutors of the club had it further in their view, to obviate that tendency which the increasing refinement of manners has, to confine social intercourse in the country, chiefly to ceremonious visits between persons of similar fortune and rank; and, by bringing the landlord and tenant more frequently together in familiar converse, to connect them more closely with each other.

From the commencement of the club, premiums have been given for different objects; and particularly for encouraging improvements in ploughing and in breeding cattle. The club has much cause to congratulate itself on its success in promoting the first of these purposes, the mode of ploughing within the bounds of the club having been already improved beyond its most sanguine expectation.

The funds of the club arose solely from the contributions of the members, until 1807, when the late Lieut. General Fletcher Campbell bequeathed the sum of five hundred pounds Sterling, to Peter Speirs, Esq. of Culcruich, the Rev. Mr Tait of Kincardine, and Mr Littlejohn writer in Stirling, as trustees for the benefit of the club.

The ordinary meetings of the club are held once in three months. Extraordinary meetings are sometimes held

held by appointment of the club, or may be called at the discretion of the conveener. A similar power, in this respect, is vested in the respective conveeners of the several districts.

The several districts of the club are as follows : viz.

1. Garguanoek, comprehending that parish.
2. Stirling, comprehending the parishes of Stirling and St. Ninians.
3. Kippen, comprehending that parish.
4. Fintry, comprehending that parish.
5. Balfroun, comprehending the parishes of Balfroun, Killearn, and Drymen.
6. Port, comprehending that parish.
7. Kincardine.
8. Kilmadock.

The three last of these are in the county of Perth.

The number of the members of the club at present amounts to sixty, including some noblemen, and some of the most respectable gentlemen and clergymen of the neighbourhood. The club is regulated by proper rules well suited to circumstances, but which it is not here necessary to detail."

Of the utility of instituting ploughing matches, in particular, some have entertained doubts. It has been alleged that the ploughmen who have been successful in these competitions become henceforth insolent and extravagant in their demands of wages ; it is presumed, however, that the superior dexterity acquired, and widely diffused among ploughmen by these competitions far outweighs the evil complained of. There needs no other proof of this than the difference that

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is to be observed in respect to ploughing, between the carses of Stirlingshire, where ploughing matches are unknown, and the bounds of the Gargunnoch club. In the former, the operation is performed, for the most part, in a slovenly manner; the ridges are broad and crooked; in the latter, the form of the ridges, and the manner in which the furrow is turned, furnish a model.

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## SECT. II.—PROVINCIAL TERMS.

ON this subject, it is altogether unnecessary to detain the reader. The Reporter observes nothing that is peculiar either to the language or pronunciation of Stirlingshire. In the higher parts of the parishes of Drymen and Buchanan, the Gaelic language still continues to be spoken, though almost every body understands English. Throughout the rest of the county, the Scots dialect is spoken very nearly as in the Lothians. Many Scots terms, which might have proved unintelligible to our southern neighbours, have been incidentally explained in the course of this Report.



## CONCLUSION.

*Means of Improvement, and the Measures Calculated for that purpose.*

It appears to the Reporter, that he has already exhausted this subject, as far as his information extends. In Chapter XII. he has suggested every thing that occurred to him on the important *improvements* of draining, paring and burning, manuring, and irrigation. In Chapter XVII in adverting to the *obstacles* to improvement, he has at the same time attempted to suggest the means of obviating these obstacles, by the judicious enlargement of farms, by the increase of shelter, and by the more general dissemination of knowledge in subjects connected with agriculture. To what he has advanced on these subjects, he has nothing to add.

Stirlingshire, however, being, throughout so great a proportion of its extent, a grazing district, it is thought necessary to repeat a hint formerly thrown out\*, of the propriety of improving the staple of its pastures, by propagating the most valuable of our native grasses. In a late number of the Farmer's Magazine, the Reporter observed a short notice of a premium bestowed by the Highland Society of Scotland, on the Reverend and ingenious Dr Singers of Kirkpatrick-juxta, for his Essay on that subject. The selection of the plants made  
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\* P. 188.

by the Doctor appears to be very judicious. A list of the greater number of these has been given in a former part of this Report\*; and it may be added, that as nature propagate these plants abundantly, by the mere dropping of the seeds upon the ground, without any previous preparation of the soil, it may be sufficient to sow them upon the surface, and, to ensure their growth, it may be proper to pass the roller gently over them. The seeds themselves are easily preserved, especially those of the *Diadelphia* class†, which is by far the most valuable in this point of view. In bogs and meadows, where no good herbage will grow, it might be useful to sow the seeds even of the *carex* tribe, and of the *poa aquatica*.

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\* P. 189, 190.

† The Pea Flowered Plants.





*Table of the Valued and Real Rent, Ministerial Parishes.*

Parishes.		Valued Rent Scots.			Lands.			Real Rent,			Income of Poor.		
		L.	s.	d.	L.	s.	d.				L.	s.	d.
1	Airth	8638	15	6	10,089	0	0	0			115	0	0
2	Alva	2032	0	4	2273	14	0	0			34	0	0
3	Baldernock	1744	15	8	4204	17	0	0			41	0	0
4	Belfron	2078	2	4	3480	11	0	0			35	0	0
5	Bothkennar	3533	14	0	4234	0	0	0			25	0	0
6	Buchanan	2745	18	6	6711	10	0	0			34	0	0
7	Campsie	6438	0	2	11,112	18	0	0			70	0	0
8	Denny	2483	9	7	5286	15	0	0			50	0	0
9	Drymen	5069	12	0	6794	0	0	0			34	0	0
10	Falkirk	13,521	8	6	17,369	13	0	5			300	0	0*
11	Fintry	1795	7	7	3573	11	0	0			48	10	0
12	Gargunnoch	4127	15	2	5962	10	0	0			48	5	0*
13	Killlearn	2841	0	0	5493	10	0	0			40	0	0
14	Kilsyth	3916	17	9	7598	0	0	0			200	0	0
15	Kippen	3139	1	6	3051	0	0	0			75	0	0
16	Larbert & Dunipace	5763	6	3	9376	16	0	0			100	0	0
17	Muiravonside	3975	7	7	5249	10	0	0					
18	Polmont	5999	1	6	7079	18	0	0			65	0	0
19	St. Ninians	20,861	1	2	28,813	6	0	1			210	0	0
20	Slamannan	2334	11	9	3142	18	0	0			30	0	0*
21	Stirling				2175	6	0	7			438	14	6
22	Strathblane	2340	0	0	4160	15	0	0			45	0	0
	N. Kilpatrick	1014	12	3	2731	0	0	0			100	0	0
	Lecropt	450	0	8	1299	0	0	0			19	10	0
	Logie	1581	16	8	3054	0	0	0					
Total		1108,425	15	11	164,317	18	0	18	0		2157	5	0

\* In the money stipend of the first minister of Stirling is reckoned sufficiently low.

*Observations on the preceding Statistical Table.*

The foregoing table has been constructed with all the attention of which the Reporter is capable; he is still sensible, however, that it contains some defects which he finds it impossible to remedy: the following remarks may account for some of these, whilst they may, at the same time, assist future inquirers in supplying them.

1. Where any doubt is entertained concerning the precision of any article in the table, though the most probable approximation has been attempted, an asterism is affixed to that article, thus (\*.)

2. In column second, the valued rent of Alva is stated; from Sir John Sinclair's Table, at L.2032. 0s. 4d. Scots. Mr Johnstone of Alva, in his valuable communication, states it at L.4100 Scots. The valued rent of Polmont is not stated in Sir John's Tables, but included in that of Falkirk, with which that parish was formerly united: It is here given separately from the best data that could be obtained. The table shews the valued rent of Stirlingshire to be L.108,425. 15s. 11d. Scots; but it appears, from authentic documents, that the valued rent of the county is really L.108,516. 16s. 7d. Scots. The difference is probably owing to some error respecting the parishes of Alva or Polmont.

3. The real rent Sterling is given under the separate heads of lands, houses, and minerals. The data on which this estimate is founded are derived from an authentic source. The whole amounts to L.189,627. 12s.

4. In column fourth, the ministers stipends are given, as far as they can be ascertained, under the two heads of grain and money Sterling. In this article, few deficiencies will be met with. No distinction is made between bear and oatmeal; though grain stipends are sometimes paid in the one, and sometimes in the other. If the boll of victual be taken at the average price of L.1 Sterling, the whole money and victual stipend of the clergy of Stirlingshire will amount to L.4421. 19s. 4d. From this estimate, however, there must be deducted that proportion of the stipends of the three parishes, Kippen, N. Kilpatrick, and Lecropt\*, which is paid by other counties in which they are partly situated; the whole deduction necessary to be made may amount to about L.300, leaving the sum of L.4121. 19s. 4d. The value of the glebes has not been ascertained; it may be taken at the average of L.12 each; making an addition to the income of the clergy of 22 parishes of L.264. The whole income being L.4385. 19s. 4d.

5. In the column of the number of scholars, many marks of doubt occur. In the town of Stirling especially, where there are many eminent schools for the education of boys, as well as some respectable boarding schools for young ladies, the number of scholars, upon the whole, was stated upon good authority at 1120; there is reason, however, to believe that some of them had been reckoned twice; the same boys being stated under the articles of the grammar school, and the writing

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\* The proportion of the stipend of Logie paid by Stirlingshire, is accurately given in the table, as well as all the other particulars relating to that parish.

ing school. They may be taken in all at 1000 scholars, one fourth of whom probably are from the adjacent country.

6. Column sixth gives a very imperfect view of the schoolmasters emoluments, which it is very difficult to ascertain. The salaries are by law from 300 to 400 merks Scots, with a house and a rood of ground inclosed for a garden; the school wages are now very generally augmented. From every view which the Reporter is enabled to form of the subject, he is of opinion that, between salary and wages, the schoolmaster has, at an average, 18 and sometimes 20s. a year for every scholar: The number of these being pretty accurately calculated, it is presumed that the emoluments of all the teachers of schools in Stirlingshire may be taken at L.2659. 17s. 5d. as stated in the table.

It is to be observed, that in many populous parishes, there is more than one established schoolmaster, besides private teachers. Thus in Denny, there are three private schools, attended by 180 scholars. In Falkirk, there are two parochial schoolmasters, each having emoluments to the amount of L.100 a year; there are also several private teachers. In Kilsyth, there are four teachers, the emoluments of each of whom amounts to L.70. In the table, the whole emoluments of the different teachers in one parish are given *in cumulo*.

7. As to the number of the poor (column seventh) several marks of uncertainty also occur. The truth is, that it varies in every parish from year to year. In the enumeration of the poor of the parish of Stirling, those only are stated who receive alms from the funds of the kirk-session, or from voluntary contributions. An ac-



count of those who are maintained or assisted by the hospitals has been already given.

With regard to the stock of the poor, it is given accurately in almost every instance. It may be proper to state, that the stock of the poor of Kilsyth consists of 20 acres of land, which have been let at L.23, and will now probably let for more. The value of this land has been calculated at 30 years purchase.

In many instances, it has been impossible to ascertain the collections; but it may be proper to observe, that under this head, the produce of the mortcloth, proclamations for marriage, and fines for immorality, are included.

The annual income of the poor has been pretty accurately ascertained, except in one or two parishes, whether it arises from the interest of money, from collections, from parochial assessments (of which an account has been already given) or from any other source. The amount, as far as it has been ascertained, is L.2157. 5s. For the unascertained parish of Muiravonside, and a part of Logie, L.40 may be added, making in all L.2197 5s.

If to this we add the income of the Stirling hospitals, amounting, as has been stated\*, to L.4130. 4s. 7d. the total provision for the poor of the county of Stirling will appear to be L.6327. 6s. 7d. The poor of the county, including the hospital pensioners, being 1056, there will remain on an average for each the sum of L 5. 19s. 10½d. nearly.

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\* P. 366. See Note, p. 396.

## SECT. II.—LIVE STOCK.

The number of riding horses in Stirlingshire, is	319
———— of work horses	3246
Total	3565

Accurate returns have been obtained of the number of black cattle and sheep in the 12 following parishes, viz.

	Black Cattle.	Sheep.
1. Alva . . .	200*	4200.
2. Balfrou . .	615	133.
3. Buchanan . .	590	12,710.
4. Drymen . .	2093	3700.
5. Fintry . .	1320	2940.
6. Gargunnoch .	800	2000.
7. Killearn . .	806	4324.
8. Kilsyth . .	1470	1000.
9. Kippen . .	1500	200.
10. Strathblane	560	1400.
11. Campsie . .	1646	1600. From the Stat. Acct.
12. Logie . .	175	520.
	<hr/> 11,775	<hr/> 34,177

In the remaining parishes, which are situated in the eastern district of the county, and principally occupied in raising grain, no accurate account has been obtained of the live stock. By a particular analysis of every parish, however, upon the best data that occur, it is conjectured that  
the

the number of black cattle in these parishes, is about 7450, and that of sheep, about 3800: Thus the amount of live stock in the whole county will be,

Horses,	-	3564, at the average value of		
L.22 each	-		L.78,430	0 0
Black cattle,	19,225, at do. of L.6. 5s. each	120,156	5	0
Sheep,	- 37,977, at do. of 16s. each	30,381	12	0
Total value of live stock				L.228,967 17 0

The number of the horses being taken from a public register, it is presumed that it is considerably below the truth. Of the number of swine, no account has been obtained, only three parishes having made a return, viz. Drymen 100, Balfroon 19, and Killearn 30.

Of the agricultural produce of the county, it is impossible to form any accurate estimate. The number of acres of carse in the county having been reckoned at 28,500, and that of lighter soils held under cultivation, at 80,000\*; if the agricultural produce of the former be taken at L.6 per acre; and that of the latter at L.4, the result will be L.491,000.

As to the manufactured produce, the fisheries, and the minerals of the county, to form a just estimate of their annnal value is attended with equal difficulty. A reverend gentleman well acquainted with the subject, states the manufactured produce of the parish of Lárbert alone (in which the Carron-works are situated) at L.300,000 a year. If to this we add the various other

---

\* P. 41.

other manufactures which have been formerly alluded to, together with the minerals, the whole may be taken at £. 500,000. The fishery at Stirling produces about £. 1200.

*General View of the County of Stirling.*

Extent in square miles	-	-	-	645
in English acres, statute measure	-	-	-	412,800
in Scots acres	-	-	-	328,300
in do. arable	-	-	-	108,500
in mountain and valley pastures	-	-	-	194,800
in woods and plantations	-	-	-	8000
in deep mosses and wastes	-	-	-	17,000
Horses	-	-	-	3565
Black cattle	-	-	-	19,225
Sheep	-	-	-	37,977
	L.	s.	d.	
Value of live stock	228,967	17	0	
Value of manufactured produce, fishery, and minerals	501,200	0	0	
Value of agricultural produce.	491,000	0	0	
Value of woods cut annually	4000	0	0	
Valued rent, Scots	108,516	16	7	
Real rent Sterling in houses and lands	183,143	4	0	
Number of the inhabitants in 1755	-	-	-	37,004
Do. in 1790—1798	-	-	-	44,886
Do. in 1801	-	-	-	50,811
Increase from 1755 to 1795, being 40 years	-	-	-	7882
Do. from 1795, to 1801 being 6 years	-	-	-	5925
Inhabiting towns and villages	-	-	-	22,804
Inhabiting the country part	-	-	-	28,007
				Number

Number of inhabitants in 1801, to every square mile			109½
English acres to each inhabitant in 1801			8½
Ministers stipends, including glebes	L.4385	19 4	
Average to each minister nearly, reckoning 25 ministers	190	13 10½	
Number of scholars			4608
Schoolmasters salaries and emoluments	2559	17 5	
Number of poor, including the Stirling hospitals			1056
Capital stock of poors funds	6233	0 0	
Annual income of the poor, including the hospitals	6187	5 6	
Average to each	5	17 2*	

No.

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\* N. B.—In p. 366, an error of the press in stating the present income of Allan's hospital at L.568. 16s. 9d. escaped notice : It should have been stated at L.468. 15s. 9d. This circumstance occasions some discrepancy between the above statement and that in p. 366.

## No. II.

*The Fiars of Stirlingshire for 40 years.*

## First Series.

	Wheat.			Carse Barley.			Dryfield Do.			Oatmeal per Boll.		
	L.	s.	d.	L.	s.	d.	L.	s.	d.	L.	s.	d.
1757	0	18	0	0	13	4	0	12	11	0	13	0
1758	0	15	0	0	9	5 <sup>4</sup> / <sub>12</sub>	0	9	2	0	9	2
1759	0	13	0	0	9	2	0	9	0	0	8	4
1760	0	13	6	0	9	2	0	8	9	0	8	10
1761	0	13	6	0	10	0	0	9	7	0	10	5
1762	0	17	0	0	13	10	0	13	4	0	14	2
1763	0	15	0	0	13	4	0	12	10	0	12	1
1764	0	16	0	0	15	0	0	14	6	0	13	4
1765	1	0	0	0	19	0	0	19	0	0	16	0
1766	0	18	0	0	18	0	0	17	0	0	13	4
1767	0	19	0	0	17	0	0	16	2	0	15	0
1768	0	19	0	0	13	0	0	12	8	0	12	6
1769	0	17	0	0	14	2	0	13	10	0	13	4
1770	0	17	0	0	14	6	0	14	0	0	13	0
1771	1	0	0	0	17	0	0	15	6	0	15	0
1772	1	2	6	0	17	6	0	16	8	0	15	0
1773	1	3	4	0	17	6	0	16	8	0	15	6
1774	1	0	0	0	16	8	0	16	0	0	15	0
1775	0	17	0	0	14	0	0	13	4	0	12	0
1776	0	17	6	0	13	0	0	11	8	0	12	6
Medium price for 20 years.	0	17	9 <sup>6</sup> / <sub>12</sub>	0	14	2 <sup>2</sup> / <sub>12</sub>	0	13	3 <sup>1</sup> / <sub>12</sub>	0	12	10 <sup>6</sup> / <sub>12</sub>

First

## First Series Continued.

	Wheat.			Cane Barley			Dryfield Do.			Oatmeal per Boll.		
	L.	s.	d.	L.	s.	d.	L.	s.	d.	L.	s.	d.
1777	1	0	0	0	14	0	0	13	6	0	12	9
1778	0	19	0	0	14	0	0	13	6	0	12	6
1779	0	13	9	0	12	6	0	12	0	0	11	0
1780	0	17	6	0	13	0	0	12	6	0	13	6
1781	0	19	0	0	13	0	0	13	0	0	12	0
1782	1	4	0	1	2	6	1	0	0	0	19	0
1783	0	19	0	0	16	6	0	16	0	0	15	9
1784	1	0	6	0	19	0	0	18	0	0	15	0
1785	0	19	0	0	15	6	0	13	4	0	13	6
1786	0	19	0	0	16	6	0	15	6	0	15	0
1787	0	19	6	0	17	0	0	16	0	0	14	0
1788	1	0	6	0	14	0	0	13	4	0	12	6
1789	1	2	6	0	16	0	0	15	6	0	13	6
1790	1	2	0	0	16	0	0	15	0	0	15	0
1791	1	0	0	0	19	0	0	18	0	0	15	0
1792	1	0	6	1	0	0	0	19	0	0	16	8
1793	1	2	0	0	18	0	0	17	0	0	16	0
1794	1	3	6	1	2	0	1	1	6	0	16	0
1795	2	2	0	1	3	0	1	1	0	1	0	0
1796	1	6	6	1	3	0	1	2	0	0	16	0
Medium price for 20 years.	1	1	5 <sup>10</sup> / <sub>11</sub>	0	17	2 <sup>1</sup> / <sub>11</sub>	0	16	3 <sup>4</sup> / <sub>11</sub>	0	14	7 <sup>2</sup> / <sub>11</sub>

The

*The Fairs of Stirlingshire from 1797 to 1808 Inclusive.*

## Second Series.

	1797.			1798.			1799.			1800.			1801.			1802.			1803.			1804.			1805.			1806.			1807.			1808.		
	L.	s.	d.	L.	s.	d.	L.	s.	d.	L.	s.	d.	L.	s.	d.	L.	s.	d.	L.	s.	d.	L.	s.	d.	L.	s.	d.	L.	s.	d.	L.	s.	d.			
Oatmeal - -	0	16	00	0	16	01	0	10	02	0	00	17	00	18	00	19	01	0	01	2	01	8	01	6	0											
Wheat - -	1	0	01	1	02	0	02	14	01	15	01	6	01	4	01	17	01	11	01	14	01	11	02	3	0											
Common malt	1	0	01	1	01	10	02	8	01	10	01	5	01	13	02	7	02	2	02	0	02	0	02	0	0											
Kerse bear -	0	18	00	0	17	01	7	02	4	01	6	01	0	00	17	01	6	01	7	01	5	01	6	0	0											
Dryfield bear	0	17	00	0	16	01	7	02	2	01	5	00	15	00	16	01	8	01	4	01	5	01	2	0	0											
Muirland bear	0	15	00	0	14	01	0	01	16	01	3	00	12	00	13	41	4	01	0	01	0	00	17	00	18	0										
Peas and beans	0	15	00	0	13	01	8	02	4	00	18	00	17	00	18	00	19	00	18	01	6	01	10	01	12	0										
Kerse oats - -	0	14	00	0	15	01	4	01	14	00	17	00	16	00	17	00	18	00	19	01	1	01	6	01	2	6										
Dryfield oats -	0	13	00	0	14	01	3	01	13	00	15	00	13	00	16	00	17	00	18	00	19	01	3	01	2	0										
Air seed oats -	0	13	00	0	14	01	6	01	10	00	15	00	13	00	15	00	16	00	17	00	19	01	0	0	None pr.											
Kerse barley -	0	19	00	0	18	01	10	02	6	01	7	01	2	00	18	01	12	01	8	01	9	01	10	01	9	0										
Dryfield barley	0	18	00	0	17	01	9	02	5	01	6	00	18	00	17	01	11	01	6	01	8	01	8	01	8	0										
Barley malt -	1	3	01	2	6	1	12	2	11	01	11	01	8	01	18	02	10	02	6	02	4	02	4	02	5	0										
Bucked oats -	0	12	00	0	12	0																														
Grey oats - -	0	7	00	0	7	6																														

No such grain now sown in this county.

No such grain now sown in this county.

The



This may be the proper place to give a table of the average weight of barley for seven years, from the year 1791, as stated in an authentic document : The average is taken both from carse and dryfield grain raised in the vicinity of Falkirk. The boll is the Stirlingshire measure; the weight, Dutch or Troy, 16 lbs. to the stone.

	Stones.	Lib.	
Crop 1791,	18	2	per boll.
1792,	18	5	
1793,	18	9½	
1794,	18	6½	
1795,	18	8	
1796,	19	1½	
1797,	17	8	

### No. III.

Mr Walker of Falkirk, to whose communications the Reporter is already so much indebted, having had the goodness to peruse this volume, after it had been *printed off* as far as page 240, was pleased to add some corrections and observations on the margin. Though it was then too late to adopt these in their proper place in the body of the work, they are deemed of such importance as to merit preservation in this Appendix, with a reference to the passages to which they apply.

P.

P. 49.—To the notice given of the coal-works, Mr Walker adds, "That those upon the Kinnaird and Carron-hall estates are now in the possession of the Carron Company, which sells the coals at 10s. per ton. The Dunmore pits are given up."

P. 80. l. 5.—"The tack is ended; the proprietor, the Duke of Hamilton, has not yet got a tenant, and the work is silent"

P. 88. l. 4.—To the observation on the extent of landed estates in Stirlingshire, Mr Walker adds, "From L.2 to upwards of L.10,000."

P. 87.—To the observation made towards the bottom, on the proper size of farms, Mr Walker adds, "No corn farm should be less than 200 acres, to make a thrashing machine necessary."

P. 88. l. 9. from the bottom.—For "35 acres," say "80"

P. 98.—To the remarks on the livings of the clergy, Mr Walker adds, "That the way in which the stipends of many of the clergy in Scotland are paid is most degrading, and occasions many quarrels with the small heritors. How troublesome," says he, "must it be to a minister to be obliged to write out receipts for four pennies; and, with a lippie measure in his hand, to receive the stipend paid in kind from the small tricky heritors, who are imposing upon him grain of the worst quality. The stipends of the clergy, whether grain, or the value of it, should be collected by a person appointed for the purpose, at the expence of the heritors, and the whole paid in at once to the minister."

P. 113.—Mr Walker observes, "That the roller divided into two parts is the best, as it does not rub  
 c c ground

ground in turning, like the roller in one piece; but as the one end goes forward, the other goes back."

P. 117.—Mr Walker disapproves of having the kiln and mill under one roof; as if the former takes fire, the latter is in danger also.

P. 130.—On the observation offered at line 9. with regard to the form of ridges, Mr Walker remarks, "That all land should get a single *tine* of harrowing across the ridges, to prevent the seed from falling between the furrows; in which case it drops down to the bottom, and never comes up; whereas the cross harrowing places the seed evenly, and lays it upon the middle of the furrow, where it has the best chance to grow, and none of it is too deep buried."

P. 133.—To the observations on weeding, Mr Walker adds, "That the surest way of extirpating weeds is to fallow upon all kinds of soils, even the lightest; the weeds, which were a curse to the soil, being tamed into manure, become a blessing to it. Weeds of all kinds, which grow upon the sides of roads, &c. should be carefully cut down when they are in flower."

P. 141.—Towards the bottom, Mr Walker observes, "That in ploughing for summer fallowing in the corses, the furrow should be ten or twelve inches deep; the deeper it is, the plants have the greater scope to search for their food, and the soil is more able to imbibe moisture. The principal part of the fallowing process should be performed in the end of May, and in June, when the day is long and the sun hot; the oftener the ground is ploughed and harrowed, and the deeper ploughed, the better. Fallowing should not be attempted while the ground is wet.

P. 145.

P. 145.—An error had been committed in stating Mr Walker's rotation of crops ; it is as follows, viz.

1. Fallow with lime, providing that the ground has not been limed within 20 years before.
2. Wheat.
3. Drilled beans with dung.
4. Wheat.
5. Potatoo oats with three or four ploughings, and grass seeds.
6. Hay.
7. Oats.

P. 146.—To the observations on seed, Mr Walker adds, " That he has got his seed wheat from several parts of England, particularly from Essex and Kent, and also from several counties in the north of Scotland, particularly from Perth and Forfar ; that he has sown the same kind of white wheat that he had from England, and the same kind of white wheat that he had from the north, on the same field, and on the same day ; that that which he had from the north succeeded best ; and that he continues to get his wheat seed for the most part from that quarter. He is of opinion that the air has an effect upon grain, as well as the soil upon which it grows."

P. 148.—On the time of sowing wheat, Mr Walker states, " That it is a much surer crop to sow in the beginning of March than in the beginning of December ; when sown late, the young plants are unable to stand the winter and spring frosts ; when the plants are thin, they keep *tillering* (or sending forth new shoots)

shoots) when they should be shot into seed; whereas wheat sown in the spring runs no such risk; and the plants being thick, ripen much sooner. Mr Walker has practised sowing the common wheat in March for many years with success."

P. 151.—"One great error in stooking corn is to put the knot outwards, as it is the first to grow in wet weather; the root of the band should be placed outwards."

P. 160. l. 5.—"Six firlots bean measure are given to the acre."

L. 3. from the bottom.—For "wheat 12 bolls," say, according to Mr Walker, "8 bolls."

P. 161.—To Sect. X. Of Tares, Mr Walker adds, "A great many vetches or tares are annually sold in Falkirk market; they are very generally sown among beans, which prop them up; when thrashed, they are separated from the beans, and sold by themselves. They generally bring a much higher price than pease or beans."

P. 167. l. 5.—Of the drill plough, Mr Walker says, "Call it the drill barrow, some of these sow only one drill, and some more. If the barrow sows two or three drills at once, the roller affixed to the barrow is long enough to cover them all."

P. 163.—To the remarks made on the best soil for potatoes, Mr Walker adds, "No land produces more abundant crops of potatoes, or of a finer quality, than the carse; but it must be well pulverized, ploughed and harrowed at least six times; if potatoes of fine quality be wanted, no dung should be applied."

P. 180.

P. 180.—Of the annual and perennial rye-grass seeds, Mr Walker remarks, "That some are of opinion that they are the same, and that their standing or not standing is accidental; that if the grass which is thought to be perennial be allowed to stand till the seed is ripe, and then cut off the ground, taking care that none of the seed shake off, there will be no rye-grass next year, as the root, say they, will not sprout again, more than the stubble of ripe oats."

## IV.

The Reporter having, by the kind offices of a friend, obtained a correct list of the population of the parish of Falkirk, taken, under all the particulars that are interesting in a statistical view, since the 27th May 1811, it is hoped that the reader will be gratified by finding it subjoined.

*Statistical Table of the Population of Falkirk, 1811.*

Number of families in the parish	-	-	2393
Do. of families employed in agriculture	-	-	171
Do. employed in trade and manufactures	-	-	835
Do. employed in neither of the above	-	-	1887
Number of males, exclusive of local militia and seamen	-	-	4541
Do. of females	-	-	5388
Total population, with the above exceptions			9929
c c 3			Males

Males in the town of Falkirk, with the above exceptions	- - - - -	1890
Do. Females	- - - - -	2306
Total population of the town of Falkirk		<hr/> 4196

The number of local militiamen in this parish is 246, and the average number of seamen is 220; which two numbers being added to 9929, makes the population of the whole parish of Falkirk - 10,395

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POSTSCRIPT,

**POSTSCRIPT.**

THE Reporter is happy to have it in his power to state, upon unquestionable authority, that the Magistrates of the good town of Stirling have this year (1811) sold the town dung or fuilzie for a sum nearly equal to the premium *given* two years ago for removing it.

Juvat hæc opprobria—  
——potuisse refelli.

He regrets his being now under the necessity of requesting the reader's indulgence to a too copious list of errata which have crept into the preceding pages. He hopes that his great distance from the press will in some measure plead his excuse.

**ERRATA.**

## ERRATA.

- Page 2 line 9, *for* Almond, *read* Avon.
- 8 8, Beneloch is situated in Clackmannanshire.
- 8 1 from the bottom, *for* country, *read* county.
- 14 In Table I. Of the Winds, Thermometer, and Weather, Dr Macfarlane suggests the following corrections, viz.  
*for* 109 71 39 128 142 146 59  
*read* 115 75 43 132 148 152 65
- 25 3 from the bottom, *for* parks, *read* park.
- 44 17, *for* Lychris, *read* Lychnis.
- ib. 7 from the bottom, *for* are, *read* is.
- 53 4 from the bottom, *for* stratas, *read* strata.
- 73 8 from the bottom, *for* necessary, *read* unnecessary.
- 80 7, *for* in, *read* of.
- 105, and elsewhere, *for* agriculturalists, *read* agriculturists.
- 132 10 from the bottom, *for* souchus, *read* sonchus.
- 164 14, *for* de-, *read* degree.
- 182 2 from the bottom, *for* pared, *read* prepared.
- 187 9, *for* menyanthe, *read* menyanthes.
- 279 10 from the bottom, *dele* upon.
- 351 6, *for* come, *read* came.
- 366 Mr Mackinlay's account of the revenue of Allan's hospital should be stated at L.468. 15s. 9d.
- 368 10 from the bottom, *for* ten, *read* eleven.

F I N I S.

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*Alex. Smellie, Printer.*



1. The first part of the paper discusses the importance of the study of the history of the United States. It is argued that a knowledge of the past is essential for a full understanding of the present and for the development of a sound policy for the future. The author points out that the study of history is not only a means of acquiring knowledge, but also a means of developing a sense of responsibility and a sense of civic duty. It is through the study of history that we learn of the successes and failures of our ancestors, and we are able to draw lessons from their experiences. The author also emphasizes the importance of the study of the history of the United States, particularly in the context of the current political and social climate. He argues that a knowledge of the history of the United States is essential for a full understanding of the current political and social issues, and for the development of a sound policy for the future.

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